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REVIEW OF BROADVIEW ACRES INJECTION SYSTEM AT UNITED NUCLEAR-HOMESTAKE PARTNERS' MILL NEAR MILAN, NEW MEXICO

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INTRODUCTION

This report is a review of the Broadview Acres Injection System to determine if this system has operated as designed. Six injection wells were designed to inject water along UNHP's southern property line to improve the water quality in the Broadview Acres alluvial aquifer (see Drawing 1 for location). The alluvial aquifer was simulated with a computer model to predict the effectiveness of these injection wells. Modeling results and design specifications for the injection system can be found in UNHP's report, ("Modeling, Design, and Specifications of the Collection and Injection Systems.") The injection wells were modeled at a total injection rate of 300 gpm. Injection has occurred for three periods, 6/13/77 to 12/30/77, 5/08/78 to 1/24/79, and 4/10/79 to 8/31/80. Average total rates of 50.5, 76 and 41 gpm respectively, were obtained for the three injection periods.

United Nuclear-Homestake Partners (UNHP) entered into a ground-water protection plan on 8/18/76 with the New Mexico Environmental Improvement Agency. A letter on 5/26/77 to the State of New Mexico from UNHP outlines the proposed monitoring program. The monitoring program consisted of the following:

WATER QUALITY

Site	Parameters	Frequency
Sub-1	Na, HCO_3, So_4, U, Se, Mo, Ra_{226}, No_3 and As	Monthly (dropped)
Sub-2	"	" (quarterly)
P	"	Monthly for 3 mo., then semi-annually
Q	"	"
R	"	"
Deep Well #2	All ground-water Regs. (plus sodium and bicarbonate)	Bi-monthly (quarterly)

WATER LEVEL

Site	Frequency	
Sub-1	Daily for 5 days, then weekly	(dropped)
Sub-2	"	(monthly)
Sub-3	"	(dropped)
Sub-4	"	(dropped)
Injection Wells	"	(dropped)
(GH)	(monthly)	
(H)	(monthly)	

NOTE: Parentheses contain modifications to monitoring program on 8/06/79.

Monitoring wells Sub-3 through Sub-8 and wells GH and H were not part of the formal agreement for water quality with the State. Wells P, Q and R are the background wells which are shown on Drawing 1, north of UNHP's mill. The source of the injection water is UNHP's Deep well 2, which is a San Andres well. Wells GH, H, Sub-1, Sub-2, Sub-3 and Sub-4 are used to evaluate the water level changes. Consent to use wells Sub-3 and Sub-1 for monitoring was lost in September, 1978 and May, 1979 respectively. A change in the well head of well Sub-4 made it unaccessible for water level measurements after September, 1978. Results from wells Sub-1 through Sub-8, GH and H are used in the review of water quality changes. Drawing 1 shows the injection wells G, GG, GA, GB, GC and GD, and the monitoring wells GH, H and Sub-1 to Sub-8.

A summary of the results from this review will be presented first and followed by recommendations for changes in the injection system to obtain the desired water quality reductions. The review of the injection system consists of three topics; injection rates, water level changes and water quality changes. These three items present the review in detail, while the Summary and Recommendation Sections should be consulted for a general review.

SUMMARY

The injection wells have been operated for three separate periods, from 6/13/77 to 12/30/77, 5/08/78 to 1/24/79 and 4/10/79 to 8/31/80. Average total injection rates of 50.5, 76 and 41 gpm were respectively measured for these three periods. Injection rates of 55, 90 and 45 gpm were used in the water level predictions because these higher rates are thought to be more reflective to the water level changes than the actual average injection rate.

Water levels were plotted versus time since injection started on semi-log paper for the three injection periods. Jacob's straight-line method was used to evaluate the water level rises in observation wells and make water level rise predictions for injection rates of 175 and 300 gpm. The predictions for 300 gpm injection rate compared fairly well with the computer model results. The predictions for the close wells GH and Sub-3 were smaller than the model results, while predictions for the distant wells H, Sub-1 and Sub-2 were larger than the model results.

Water quality-time plots were used to evaluate the change of water quality for each well, while concentration maps were used to review the water quality changes areally in the Broadview Alluvium. Table 6 presents the maximum concentrations of the background wells, maximum concentrations of the injection water, the drinking ground-water standards and maximum concentration in the Broadview Acres ground water before injection and in August, 1980. Table 7 gives the concentrations for each constituent from the Broadview wells before injection and in August, 1980. The water quality constituents in Broadview Acres are to be lowered to the background levels to meet the Groundwater Protection Plan Agreement. Constituents with drinking water standards below the background levels are more critical parameters with respect to lowering these concentrations to background levels. Parameters such as uranium with a much higher drinking standard than the background level should not be as critical. Selenium is likely to be the

parameter of most concern.

The reduction of concentrations in the southern Broadview Acres will probably take several years at the past injection rates. These injection rates do not develop sufficient gradients to move the water fast enough. It is likely that an additional six months to one year of injection is needed to reduce all concentrations to background levels at an injection rate of 300 gpm. An injection rate of 175 gpm will probably take an additional one to one and one-half years to reduce the concentration to background levels. These estimates were made from the predicted water levels, an average permeability of 30 ft/day and an effective porosity of 0.1.

The following is a general review of the present condition of each water quality parameter for Broadview Acres. The sulfate concentration of wells Sub-3 and Sub-4 are below the maximum background level of 1330 mg/l (see Tables 6 and 7). Wells Sub-2 and Sub-8 contain water with the highest sulfate concentration. Well Sub-2 will probably maintain high concentrations of sulfate for several months and probably be the governing well for sulfate. The reduction of sulfates in this well probably would take six months to one year at a total injection rate of 300 gpm.

Sodium concentrations exhibit similar patterns as sulfate and will probably take approximately the same amount of time to reach the desired concentrations. The maximum background for sodium is 350 mg/l, while the maximum injection concentration is 250 mg/l.

Bicarbonates of water from the monitoring wells on 8/80 were all below the 540 mg/l for the maximum background concentration except the bicarbonate of well Sub-5. The bicarbonate concentration from well Sub-5 should be below 540 mg/l in approximately six and three months for injection rates of 175 and 300 gpm respectively. Bicarbonate should be decreased below the maximum background level before several of the other parameters.

The maximum background level for ntirate has been 28.5 mg/l which is greater than the nitrate values in the Broadview Acres Alluvium. Nitrates have been improved considerably by the past injection with most values below or close to the ground-water drinking standard of 10 mg/l on 2/13/79 and 8/80.

Concentrations of uranium in all of the Sub wells were below the maximum background concentration except for Wells Sub-3, Sub-5, Sub-6 and Sub-8. The concentration of wells Sub-3 and Sub-8 probably can be decreased below the background level in a few months if the injection rate can be increased. Water in well Sub-2 will probably increase considerably in concentration in the next few months. This well will probably take the longest to be lowered below the background level after it increases.

Selenium probably will take the longest to be lowered below the background concentrations. Concentrations have been decreased below 0.3 mg/l to approximately 500 feet south of the injection wells (see Figure 111). Water in wells Sub-2, Sub-5, Sub-6, Sub-7 and Sub-8 contain values significantly above background values. Well Sub-2 and Sub-7 will probably be the last two wells to be lowered below background levels.

Wells Sub-5 and Sub-8 contain a molybdenum concentration above the maximum background level. It will probably take several months to lower the level of molybdenum below the background level at an increased injection rate. Molybdenum should be below background levels in all wells before some of the other parameters.

The concentration of radium 226 in 8/80 was significantly below the background levels in all wells (see Figure 119). Concentrations of the distant wells have changed similar to the wells which are close to the injection wells. This indicates that a different factor has attributed to decrease in radium 226 concentrations. Radium should not be a controlling factor with respect to stopping the injection system.

Arsenic has also been monitored for the Broadview Acres Injection System. Concentrations of arsenic for all wells in the subdivision is 0.01 mg/l or less. Concentration-time plots and concentration maps for arsenic were not plotted due to the consistently low concentrations.

RECOMMENDATIONS

The following are several recommendations for changes in the Broadview Acres Injection System:

1. Drill seven additional injection wells and extend the injection pipe line east to well H. Injection into these seven new wells and well H should allow the total injection rate to be increased to a value in the range of 175 gpm. Six of these wells will enable injection to the east of the existing line, while two wells are proposed between existing wells. New wells are proposed instead of further development work on the existing wells because the new wells should be more effective. Drawing 1 shows the location of the proposed new wells.

2. Arsenic, nitrate and radium are proposed to be dropped from the water quality parameters. Significant concentrations of arsenic have never been measured in the Broadview Acres alluvial water. Radium and nitrate concentrations in Broadview allumium are below both the maximum background level and the ground-water standard. These parameters should be continued for the Deep Well 2 list of constituents.

INJECTION RATES

The six injection wells were operated from 6/13/77 to 12/30/77, 5/08/78 to 1/24/79 and 4/10/79 to 8/31/80. Injection rates were monitored weekly and reported to the State on a monthly basis. Figure 1 presents the average monthly injection for well G. The average injection rate for well G during the first injection period (6/13/77-12/30/77) was 12.6 gpm while 14.7 and 10.4 gpm were the rates for the second and third periods respectively.

Figure 2 shows the injection rates for the three injection periods for well GG. Average injection rates of 14.8, 16 and 1.4 gpm were measured for this well for the three injection periods. The ability of well GG to accept water decreased very significantly the last injection period.

The average monthly injection rates for wells GA and GB are presented in Figures 3 and 4 respectively. Well GA was operated at similar rates for all three injection periods while the injection rate for the second period for well GB was approximately five to four times the first and third injection periods. An increase of development of well GB probably attributed to the increased injection rate for the second period.

Figures 5 and 6 present the monthly injection rates for wells GC and GD. Both of these wells were operated at larger rates for the second injection period than the other two periods. The injection rates for wells GD and GC were 10.6 and 3.8 gpm respectively for the third injection period.

Water level changes in wells should form a straight line on semi-log paper with time on the log scale. Therefore, it is useful to observe the total injection rate on the same type of plot. Figure 7 presents the total injection rate for the first injection period on a semi-log graph. The total injection rate was in the range of 30 to 40 gpm for the first 75 days of injection, while the average injection rate for the remainder of the first injection period was approximately 60 gpm. The total average injection rate for the first period was 50.5 gpm.

Total injection rates varied considerably for the second injection period. Figure 8 presents the total injection rate for wells G, GG, GA, GB, GC and GD. Injection rates above 100 gpm were maintained during the first and last portion of this injection period with approximately three months of very low injection rates in the middle of the injection period.

Figure 9 presents the total injection rate for the third period on semi-log paper. The injection for the third period consisted of an average rate of 41 gpm with significant variations in the injection rate over the period.

The average total injection rate which is more reflective to the water level changes in the observation wells is thought to be 55, 90 and 45 gpm respectively for the first, second and third injection periods. These values are higher than the actual average injection rates, but the higher injection rates are thought to influence the water level changes more than the lower ones. The use of the higher average injection rates will produce more conservative water level change predictions.

WATER LEVEL CHANGES

Water levels have been monitored on a weekly basis in six wells. Wells GH, H, Sub-1, Sub-2, Sub-3 and Sub-4 are the water level management wells for the injection system and are shown on Drawing 1. Well Sub-4 was pumped often, which has made this well uncharacteristic of water levels in the aquifer in this area at times. Well Sub-3 was unavailable to be measured during most of the second and all of the third injection period.

Figure 10 presents the water levels for wells GH, H and Sub-4 from June 1977 to February 1979, while water levels for these wells for January 1979 to August 1980 are given in Figure 11. Water level in observation well GH responded quickly to the starting and stopping of the injection system. The initial response of the aquifer can be attributed to the aquifer's confining properties. The water level in wells GH and H demonstrated a gradual rise in water level as injection continued. This portion of the water level change in the monitoring wells is caused by the unconfining properties of the alluvial aquifer. The water level in observation well Sub-4 varies more erratically than the other observation wells which is probably caused by the pumping of this well. Accurate water level measurements were more difficult in this well because it contains a pump. Maximum water level changes for wells GH and H were six and four feet respectively.

Figures 12 and 13 present the water levels for wells Sub-1, Sub-2 and Sub-3. Water levels in wells Sub-1 and Sub-2 have changed approximately four feet during the injection. Water levels in well Sub-3 are not complete and the available data does not follow a uniform pattern. Some of the water level fluctuations could be attributed to barometric pressure changes. Water level changes caused by barometric changes are probably at the most one foot.

Jacob demonstrated that drawdowns on water level rises in a well should form a straight line on semi-log paper after the u value in Theis' Well Function becomes less than 0.01. Pages 98 to 100 of Ferris (1962) has a good discussion on Jacob's Method (Theis Modified Method). The u value in Theis' Well Function decreases for a particular well as time increases. Therefore, the water level rise in the observations wells should form a straight line on semi-log paper when u approaches 0.01. Normally, water level changes form a straight line for u values less than 0.1 instead of 0.01. The following form of Jacob's Equation will be used to evaluate the water level changes in the injection observation wells:

$$T = 264Q/\Delta s$$

where: T = transmissivity of the alluvial aquifer, in gal/day/ft

Q = total injection rate, in gpm

Δs = water level change for one log cycle, in feet

The transmissivity of the aquifer will be estimated with the above equation for measured water level rises. The equation will be reversed to estimate the slope of the water level rise for a new discharge. The water level rise in a well for a new discharge can be predicted for a particular time value from the ratio of the old discharge to its water level rise. The following is the relationship between the discharge and water level rise for a well at a constant time:

$$Q_1/s_1 = Q_2/s_2$$

$$\text{or } s_2 = (Q_2/Q_1)s_1$$

where: Q_1 = discharge of known water level rise, in gpm

s_1 = known water level rise, in feet

Q_2 = desired discharge, in gpm

s_2 = estimated water level rise for desired discharge, in gpm

Water level rises will be predicted by computing the new water level rise for a particular time value from the above equation and the slope of the water level rise from Jacob's Equation. This procedure will produce the expected straight line for water level rise for a new discharge.

WELL GH

The water level rise for observation well GH is given in Figure 14 for the first two periods of injection, while Figure 15 presents the water level rise for the third period. The water level for the first injection (6/13/77-12/30/77) is presented as x while a dot is used to represent the water level for the second injection period (5/08/78-1/24/79) in Figure 14. Table 1 gives the water level data and the time since injection started for all three periods for well GH. The straight line fit of the water level rise for both injection periods is given on this figure. These figures were plotted with shallower water levels toward the bottom of the graph. A transmissivity of 3400 gal/day/ft was computed for the straight line fit for all three periods. Discharges of 55, 90 and 45 gpm were used for the three injection periods. This transmissivity agrees with the transmissivity of 3290 gal/day/ft from a recovery test on this well (see "Groundwater Hydrology of the Alluvium").

The ratio of the discharge to the water level rise was used with the slope which was computed from Jacob's Equation to predict the water level rise for discharges of 175 and 300 gpm. Figure 14 presents the predicted water level rises for well GH for discharges of 175 and 300 gpm. This indicates that the water level in well GH should be approximately at 43.2 and 38.5 feet for the two discharges after 100 days of continuous injection.

The modeling of the injection wells at 300 gpm indicated that well GH should observe a 20 feet water level rise after 185 days of injection (see "Modeling, Design and Specifications of the Collection and Injection Systems"). The prediction in Figure 14 shows that the water level rise for well GH should be 17.4 feet after 185 days of injection at 300 gpm. The prediction from the observed drawdowns compares fairly well with the simulated results from the model study.

WELL H

Figures 16 and 17 present the water levels for the three injection periods for well H. Table 2 gives the basic data, while Drawing 1 should be consulted to locate well H. The straight line matches of the data for the three periods produce transmissivities of 5500 and 5700 gal/day/ft. The predicted water levels for injections of 175 and 300 gpm are shown on Figure 16 also. Water levels of 47.9 and 43.5 feet are predicted after 185 days of injection for rates of 175 and 300 gpm respectively. The water level rise of 10.6 feet for the 300 gpm injection rate is fairly close to the predicted water level rise of 9 feet from the computer modeling.

WELL SUB-1

The plot of the water level data from well Sub-1 is given in Figure 18 for the first two injection periods (see Table 3 for basic data). The small amount of data which is available for well Sub-1 for the third injection period was not plotted on a semi-log graph. The straight line fit of the first injection produced a transmissivity of 4500 gal/day/ft while a transmissivity of 4800 gal/day/ft was obtained from the fit of the water level from the second injection. The average of these transmissivities was used to compute the slope of the straight lines for the two predicted injection rates. The ratio of the discharge to the water level rise for one of the known injection rates was also used in defining the predicted water levels.

These predictions indicate that it should take 115 days to create a water level of 38 feet for an injection rate of 300 gpm and 310 days for 175 gpm.

WELL SUB-2

Water levels for well Sub-2 are presented on semi-log plots in Figures 19 and 20, while the basic data is given in Table 4. The straight line fits of the water level for the 55, 90 and 45 gpm injection rates produced transmissivities of 5700 and 5900 gal/day/ft. Figure 19 presents the expected water levels for injection rates of 175 and 300 gpm. Water level changes of 5.9 and 10.2 feet are predicted after 185 days of injection at 175 and 300 gpm respectively. The model results indicated a water level rise slightly less than these values.

WELL SUB-3

Water levels for well Sub-3 are questionable and are not complete. A few of the water levels for the first injection period are given in Figure 21, with the basic data in Table 5. The straight line fit of these water levels produced a transmissivity of 4400 gal/day/ft. Water level predictions for the total injection rates of 175 and 300 gpm are presented in Figure 21 also. These predictions indicate that a water level rise of 8.8 and 15.1 feet should result from the injection rates of 175 and 300 gpm respectively for 185 days. The model results indicated a water level rise of 23 feet in well Sub-3 after 185 days of injection.

The results from the predicted water level rises from the straight line matches of the past injection periods agree fairly well with the results from the computer modeling. The predicted values for the closer wells, GH and Sub-3, were smaller than the model estimates while the model predictions were smaller for the farther wells.

WATER QUALITY CHANGES

A comparison of concentrations presently in the Broadview Acres alluvium to values before injection is presented first. Water quality plots of concentrations versus time are presented for each constituent of interest. The discussion of the concentration-time plots is followed by a presentation of concentration maps for Broadview Acres.

Table 6 presents the maximum concentrations which have been observed in the background wells (P, Q or R) since they were installed in 1976. The concentrations which were measured during the operation of the injection wells is presented in the following figures. Water quality concentrations were measured approximately five times from January 1976 to the start of the injection system. These concentrations are available in UNHP's water quality report "Groundwater Hydrology of the Alluvium". The water quality of the injection water is presented in the concentration-time plots also. Table 6 presents the maximum concentrations of the injection water since injection has started. Drinking water standards are also presented in this table. The last two columns of Table 6 present the maximum concentrations in the alluvial groundwater in Broadview Acres before the start of injection and in August, 1980. The two columns show that the maximum concentration has been reduced except for selenium and molybdenum.

Table 7 presents the concentrations for each constituent before the injection was started and now. A comparison of the present values to the concentrations before injection started gives a quick estimate of the amount of improvement in the water quality near each well. The use of the maximum background concentration in Table 6 with present concentrations in Table 7 shows how much reduction in concentration is still needed.

The sulfate concentrations of all of the subdivision wells were initially above the maximum background concentration, except wells Sub-7 and Sub-8.

Radium was below the maximum background level before injection and is still below this level.

SULFATE-TIME

The sulfate concentrations for 1977 and 1978 are presented in Figure 22 for wells Sub-1, Q, R and UNHP Deep Well 2 (injection water), while Figure 23 gives the 1979 and 1980 sulfate data. The maximum injection concentration for sulfate of 680 mg/l for the Deep Well 2 is given in Table 6. This table also shows that 1330 mg/l is the maximum concentration of sulfate which has been observed in any of the background wells P, Q or R. The injection concentration is half the value which has to be obtained for the Broadview Acres alluvial aquifer. Therefore, sulfate should be one of the easier constituents to obtain the desired reduction in concentration. Figures 22 and 23 show that concentrations of sulfate in well Sub-1 have decreased slightly. This well is very close to the upper limit of the concentration for sulfate. The sulfate concentration maps will show some higher concentrations north of this well which could be observed in well Sub-1 before the concentrations of the aquifer are reduced to background.

The sulfate concentrations for wells Sub-2, Sub-3, Sub-4 and P are presented in Figures 24 and 25. Well Sub-2 has demonstrated a gradual increase in concentration during the injection. This is probably caused by the movement of higher concentration water from the north to the aquifer near well Sub-2. The sulfate concentration in well Sub-3 has decreased significantly during the injection and was measured to be 910 mg/l on 9/05/80. The sulfate concentration in the alluvial aquifer near well Sub-3 has been lowered below maximum background level. Sulfate concentrations of water from well Sub-4 have decreased steadily to levels very near the injection concentration. Only a small change in sulfate concentration is expected with additional injection. Figures 24 and 25 also present the

Wells Sub-1, Sub-2, Sub-5, Sub-7 and Sub-8 presently have concentrations greater than the background level. Levels of sulfates have been decreased in all subdivision wells except wells Sub-2, Sub-7 and Sub-8. The concentration of sodium in the subdivision wells were all in excess or equal to the maximum background level. The water from only one subdivision well is presently below the maximum background level for sodium. Sodium could be the toughest parameter to be reduced to background levels.

Five subdivision wells contained water higher than maximum background levels before injection for bicarbonate. Presently only the water in well Sub-5 is above this concentration. The bicarbonate concentration in well Sub-4 has increased slightly while the concentration of the remainder of the wells has decreased.

A reduction in nitrate concentrations has occurred in all subdivision wells except well Sub-8 which has observed a slight increase. All nitrate concentrations are presently below the background levels.

Three wells contained higher concentrations than the maximum background level for uranium before the start of injection. An increase in concentration of uranium in wells Sub-1, Sub-6 and Sub-8 have been observed during the injection period. All uranium concentrations are presently below the drinking water standard except water from well Sub-5.

Seven of the eight subdivision wells contained concentrations greater than the maximum background concentration before the start of injection. Presently six of these wells still contain concentration above background. Water in the aquifer near wells Sub-3 and Sub-4 have been reduced below the maximum background level.

Only water from well Sub-5 contained a concentration of molybdenum greater than the background level before injection. The concentration in well Sub-5 is still in the same range.

sulfate concentrations for Background Well P.

Well Sub-5 contained the highest initial sulfate concentration in Broadview Acres. Figures 26 and 27 present the sulfate-time plot for wells Sub-5, Sub-6, Sub-7 and Sub-8. Concentrations of sulfate from well Sub-5 has varied considerably showing both improvement and degradation with time. The sulfate concentration in well Sub-6 has decreased steadily during the last year to below 1300 mg/l. Well Sub-7 contains concentration slightly higher than the maximum background level. The sulfate concentrations of this well should be below 1300 mg/l within the time the concentration of well Sub-2 has decreased to this level. Concentration from well Sub-8 has increased significantly this last year. An extension of the injection line to the east should quickly improve the water quality in this well. Water level changes indicated that well Sub-2 will take approximately twice as long to reach the same water level change as well Sub-1. It is likely that well Sub-2 will also take longer to see an equal sulfate concentration change. Well Sub-7 is approximately the same distance as well Sub-2 from the line of injection wells. This well will probably see similar water quality changes. Therefore, wells Sub-2 and Sub-7 are expected to be the two wells which govern the time required to reduce the sulfate.

SODIUM-TIME

Sodium is another major constituent which has been monitored for the Broadview Acres Injection System. Figures 28 and 29 present the sodium concentrations for water from wells Sub-1, Sub-2, Q and R. The sodium concentration from well Sub-1 has not shown a definite trend, while a slight increase in sodium in well Sub-2 is indicated in Figures 28 and 29. A maximum background concentration of 350 mg/l for sodium has been observed while the maximum injection concentration has been 250 mg/l.

The sodium concentrations for the Alluvial Aquifer near wells Sub-3, Sub-4 and P are given in Figures 30 and 31. These figures show that the sodium concentration of well Sub-4 was decreased to 350 mg/l by the end of November in 1977. The concentration of sodium in well Sub-3 on 9/05/80 was 420, which is still above the maximum background of 350 mg/l. All parameters except sodium in well Sub-3 are below the ground-water standards or the maximum background level.

Figures 32 and 33 present the sodium concentrations for wells Sub-5 and Sub-6. Some decrease in concentration has been observed in well Sub-5, while the sodium in well Sub-6 has decreased steadily this last year. Concentrations of sodium from wells Sub-7 and Sub-8, which are presented in Figures 34 and 35, have been fairly steady. The sodium concentrations from these wells will not require a large decrease in their concentration to reach the 350 mg/l.

BICARBONATE-TIME

Table 6 gives the maximum background concentration of bicarbonate as 540 mg/l. The injection concentration of bicarbonate is 553 mg/l. Figures 36 and 37 present the bicarbonate-time plot for wells Sub-1, Sub-2, Sub-4 and P. The concentration of bicarbonate for each of these wells is below 540 mg/l. Figures 38 and 39 give the bicarbonate concentration for wells Sub-3, Q and R while the concentration for wells Sub-5, Sub-6, Sub-7 and Sub-8 is presented in Figures 40 and 41. Only the concentration of bicarbonate from well Sub-5 is still above the maximum background concentration for bicarbonate.

NITRATE-TIME

Maximum nitrate concentration of 28.5 mg/l has been observed in the background wells while a maximum injection concentration of 2.1 mg/l was measured. Figures 42 and 43 present the nitrate concentrations for wells

Sub-1, Sub-4, Q and R. The high nitrate concentrations in the background wells Q and R should eliminate nitrate as one of the parameters which has to be lowered in the alluvial water in Broadview Acres. A nitrate concentration (as N) of less than 10 mg/l is desirable for Broadview Acres alluvial aquifer because it is a domestic supply. This concentration should be easily reached in all wells before some of the other constituents reach background levels. Figures 44 and 45 present the nitrate-time concentrations for wells Sub-2, Sub-3, P and Deep Well 2, while concentrations for wells Sub-5, Sub-6, Sub-7 and Sub-8 are given in Figures 46 and 47.

URANIUM-TIME

Uranium concentrations of 0.72 and 0.17 mg/l have been the maximum and second highest concentrations from the background wells. Maximum concentration for the injection water has been 0.19 mg/l, while the second highest concentration of injection water was 0.12 mg/l. Figures 48 and 49 present the uranium-time plots for wells Sub-1 and Sub-3. The concentration of uranium in well Sub-1 is very close to maximum background levels, while the concentration in well Sub-3 is still higher. Well Sub-3 has seen significant decrease in uranium with a uranium concentration of 1.7 mg/l on 9/05/80.

Figures 50 and 51 give the uranium concentrations for wells Sub-2 and Deep Well 2. The uranium concentration in well Sub-2 is presently acceptable. The uranium-time plots for Sub-4, P, Q and R are given in Figures 52, 53, 54 and 55. Concentrations from well Sub-4 are low and very similar to well P. Figures 56, 57, 58 and 59 present the uranium concentrations for wells Sub-5, Sub-6, Sub-7 and Sub-8. The uranium concentrations for well Sub-5 are large, but have seen some reduction from the injection program. Concentrations of uranium in well Sub-8 have increased significantly over the past two years. Additional injection wells to the east of the present line should quickly reduce concentrations in well Sub-8.

SELENIUM-TIME

The maximum background concentration for selenium has been 0.30 mg/l while the second highest background concentration for selenium was 0.23 mg/l. The maximum injection concentration for selenium has been 0.08 mg/l. Figures 60 and 61 present the selenium-time plot for wells Sub-1, Sub-3, Q and UNHP's Deep Well 2. The concentration of selenium in well Sub-3 is below the background of 0.30 mg/l on 9/05/80 with a concentration of 0.07 mg/l.

Figures 62 and 63 presents the selenium plots for wells Sub-2, Sub-4, P and R. The selenium concentration from well Sub-2 is significantly higher than 0.3 mg/l and has not shown any trend toward improvement. The concentration in well Sub-4 was lowered below 0.3 mg/l in December of 1977. Selenium concentrations for wells Sub-5, Sub-6, Sub-7 and Sub-8 are given in Figures 64 and 65. The concentration from each of these wells is above the maximum background level. It could take several years to lower the selenium concentration in the alluvial aquifer near all of these wells at the past injection rates. Significant reduction in concentration has occurred in well Sub-6. The concentration of wells Sub-2 and Sub-7 will probably take the longest to be lowered below 0.3 mg/l.

MOLYBDENUM-TIME

A maximum injection concentration of 0.13 mg/l has been observed for molybdenum while 0.20 mg/l has been the maximum background concentration. The molybdenum-time plots for wells Sub-1, Sub-7 and R are given in Figures 66 and 67. The concentration has increased slightly in well Sub-1 during the injection. Figures 68, 69, 70 and 71 present the molybdenum concentrations for wells Sub-2, Sub-3, Sub-4, P, Q and Deep Well 2. The concentrations of the water from all of these wells is below 0.2 mg/l. The molybdenum-time plots for wells Sub-5, Sub-6 and Sub-8 are given in Figures 72, 73, 74 and 75. Well Sub-5 contains a molybdenum concentration significantly above background level, while concentration in well Sub-8 is roughly twice the background.

RADIUM-TIME

A maximum radium 226 concentration of 4.9 pCi/l was observed from the background wells, while the maximum injection concentration was 2.9 pCi/l. The radium 226-time plots for wells Sub-1, Sub-2, Sub-3, Sub-4, R, and Deep Well 2 are presented in Figures 74, 75, 76, 77 and 78. The concentration of each of these wells is normally less than 3 mg/l. Figures 79 and 80 give the radium 226 concentrations for wells P and Q. The radium concentrations for wells Sub-5, Sub-6, Sub-7 and Sub-8 are given in Figures 81, 82, 83 and 84. Concentrations of each of these wells are below the background level. Radium should not be a problem because background levels are above the values in Broadview Acres Alluvium.

SULFATE MAPS

Concentration maps for sulfate, sodium, bicarbonate, nitrate, uranium, selenium, molybdenum and radium 226 will be presented next. Maps have been constructed for four different dates, 6/13/77 (prior to start of injection) 11/30/77, 7/13/78 and 2/13/79.

Figure 85 presents the sulfate concentration map of the Alluvial Aquifer at Broadview Acres on 6/13/77 (pre-injection). Sulfate concentrations of greater than 2000 mg/l are shown in the western portion of Broadview Acres. Figure 86 gives the sulfate map on 11/30/77 which is 170 days after injection started. A significant decrease in concentration has been observed around the injection wells with the remainder of the area fairly similar to pre-injection contours. The sulfate map for the Broadview Acres Aquifer on 7/13/78 is presented in Figure 87. July 13, 1978 is 66 days after the start of the second injection. These contours are fairly similar to the contours on 11/30/77, except that the 1000 mg/l contour line around the injection wells has increased in area. Figure 88 gives the sulfate contours for 2/13/79 which shows a larger area of decreased concentrations. Wells Sub-2 and Sub-7 have demonstrated a slight increase in sulfate concentrations, while the remainder of the wells have shown some decrease. The increase in concentration of these two wells is probably caused by the flow of higher concentration water from the center of Broadview Acres toward these wells. Figure 89 gives the sulfate map for August, 1980. A significant reduction in the sulfate concentration has occurred in the alluvial aquifer near well Sub-6. A similar increase has occurred in wells Sub-8 and Sub-2.

SODIUM MAPS

Figures 90, 91, 92, 93 and 94 give the sodium concentration map for 6/13/77, 11/13/77, 7/13/78, 2/13/79 and 8/80 respectively. The pre-injection concentration map shows that two areas of greater than 700 mg/l occur in Broadview Acres. The maximum background level for sodium is 350 mg/l (see Table 6), which indicates that the concentration in most of Broadview Acres needs to be reduced. The concentration maps for 11/13/77 (170 days after start of first injection), 7/13/78 (66 days after start of second injection), and 2/13/79 (261 days after start of second injection), show a significant improvement around the injection wells with some improvement in all other wells except well Sub-2. The August, 1980 concentration shows additional improvement in wells Sub-5 and Sub-6.

BICARBONATE MAPS

Three concentration maps (6/13/77, 2/13/79 and 8/80) were developed for bicarbonate. The pre-injection map (see Figure 95) shows a significant area with concentrations greater than the maximum background concentration of 540 mg/l. Figures 96 and 97 show significant reduction in the area of concentration which is greater than the 500 contour.

NITRATE MAPS

Four concentrations maps (11/30/77, 7/13/78, 2/13/79 and 8/80) were developed for nitrate as nitrogen. A pre-injection map was not developed due to incomplete data. Figures 98, 99, 100 and 101 show the nitrate concentration maps for the Broadview Acres alluvial aquifer. More reduction in nitrate has been observed than in sulfate or sodium. Nitrate concentrations have been reduced to below the maximum background and drinking standard levels in all of the subdivision wells. The reduction of nitrate is important for the use of the alluvial water as a domestic supply with respect to infants.

URANIUM MAPS

Uranium concentrations for 6/13/77, 11/30/77, 7/13/78, 2/13/79 and 8/80 were constructed for the Broadview Alluvial Aquifer. A maximum background uranium concentration of 0.72 mg/l has been observed with the second highest concentration of 0.17 mg/l. Figure 102 presents the pre-injection uranium map for the Broadview Alluvium. The area of concentration greater than 5 mg/l which is above the ground-water domestic standards is the main area of concern with respect to uranium. Figures 103, 104, 105 and 106 show significant reduction of concentrations near the injection wells with some improvement in the other wells.

SELENIUM MAPS

Concentration maps for selenium were developed for 6/13/77, 11/30/77, 7/13/78, 2/13/79 and 8/80. The maximum contour line on the pre-injection map is one, while the maximum concentration of the background wells was 0.30 mg/l. Most of the western part of Broadview Acres is above 0.3 mg/l. Selenium maps for 11/30/77, 7/13/78, 2/13/78 and 8/80 are given in Figures 108, 109, 110 and 111 respectively. The concentration of water in wells Sub-2 and Sub-7 have steadily increased with injection. These two wells will probably take the longest to be lowered below 0.3 mg/l. The selenium concentrations for these two wells could likely be the last constituent to meet the desired improvement.

MOLYBDENUM MAPS

Molybdenum concentration maps were constructed for 6/13/77, 2/13/79 and 8/80 for the Broadview Alluvium. The maximum background level for molybdenum has been 0.20 mg/l. Approximately the western one-third of Broadview Acres had concentrations higher than this prior to injection (see Figure 112). The concentration maps on 2/13/79 and 8/80 (see Figures 113 and 114) show that the concentration of the northern half of Broadview Acres has been reduced below the background level. The movement of the higher concentration of molybdenum seems to be mainly to the south of well Sub-5, and therefore wells Sub-2 and Sub-7 might not be influenced by the higher molybdenum water.

RADIUM MAPS

Radium 226 concentration maps were constructed for the five different times for Broadview Acres. The maximum concentration of the background wells for radium 226 has been 4.9 mg/l. The pre-injection map which is shown in Figure 115 does not contain any concentrations above this value. Figures 116, 117, 118 and 119 show a large decrease in radium concentrations over all of Broadview Acres. Concentrations of radium have significantly decreased in wells which the injection has not reached. This indicates that the decrease in concentration of radium is caused by a different factor than injection. The radium concentrations in the alluvial aquifer in Broadview acres do not need further reduction.

REFERENCES

Ferris, K.G., D.B. Knowles, R.H. Brown, and R.W. Stallman. 1962. Theory of Aquifer Tests. U.S. Geological Survey, Water-Supply Paper 1536-E.

TABLE 1. WATER LEVEL DATA FOR OBSERVATION WELL GH

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-09-77			49.76
13	0		-
14	1		48.90
15	2		48.49
16	3		48.44
17	4		48.60
18	5		48.69
19	6		48.68
20	7		48.71
22	9		48.90
23	10		48.89
27	14		48.75
29	16		48.81
7-01-77	18		48.78
05	22		48.75
08	25		48.60
12	29		48.57
15	32		48.61
19	36		48.52
22	39		48.60
26	43		48.46
29	46		48.52

TABLE 1. WATER LEVEL DATA FOR OBSERVATION WELL GH (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1, days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
8-02-77	50		48.47
05	53		48.69
15	63		48.43
22	70		48.24
26	74		48.07
30	78		48.18
9-06-77	85		47.68
12	91		47.20
20	99		47.81
27	106		47.63
30	109		47.17
10-04-77	113		47.38
07	116		47.25
17	126		47.98
28	137		46.87
11-01-77	141		47.45
08	148		46.57
11	151		46.86
29	169		47.09
12-16-77	186		46.38
30	200		-
1-24-78	225		48.15
2-21-78	253		48.78
3-08-78	268		48.79

TABLE 1. WATER LEVEL DATA FOR OBSERVATION WELL GH (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1, days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
4-06-78	297		48.60
24	315		48.90
5-08-78	329	0	48.89
4-09-78	330	1	47.43
11	332	3	47.14
16	337	8	46.41
30	351	22	46.15
6-15-78	367	38	46.91
7-18-78	400	71	46.87
8-01-78	414	85	46.91
9-21-78	465	136	45.23
10-03-78	477	148	46.54
11-07-78	512	183	44.47
12-08-78	543	214	43.88
19	554	225	44.35
1-17-79	583	254	45.13
31	597	268	45.24

TABLE 1. WATER LEVEL DATA FOR OBSERVATION WELL GH (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
1-07-79	-	46.67
31	-	45.24
2-07-79	-	45.87
13	-	46.30
20	-	47.67
27	-	47.66
3-06-79	-	48.30
13	-	48.17
27	-	48.32
4-03-79	-	48.35
04	-	48.41
06	-	48.48
09	-	47.92 (ET)
12	2	47.67
19	9	45.94
30	20	53.44
5-21-79	41	45.05
6-04-79	55	43.52
12	63	44.56
20	71	46.55
25	76	45.06
7-03-79	84	46.69
10	91	47.66
17	98	48.21
24	105	48.08
31	112	48.34
8-14-79	126	48.51
21	133	46.90
23	135	45.72
27	139	45.63
9-04-79	147	46.36
07	150	46.45
11	154	45.46
20	163	46.20
25	168	45.74
10-02-79	175	47.46
03	176	45.91
17	190	47.54
22	195	45.84

ET - Electric Tape

TABLE 1. WATER LEVEL DATA FOR OBSERVATION WELL GH

(cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
11-06-79	210	46.10
13	217	46.06
26	230	46.11
12-05-79	239	45.24
13	247	46.10
19	253	45.88
1-17-80	282	46.32
21	286	45.40
29	294	45.63
2-04-80	300	45.35
18	314	45.55
28	324	45.81
3-08-80	333	46.70
17	342	46.48
4-03-80	359	46.34
5-21-80	407	47.59
27	413	47.60
6-06-80	423	48.02
12	429	46.51
24	435	46.47
7-02-80	443	46.90
17	458	47.50
21	462	48.22
28	469	45.67
8-18-80	490	47.41

TABLE 2. WATER LEVEL DATA FOR OBSERVATION WELL H

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1, days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-13-77	0		53.70
14	1		53.90
15	2		53.89
16	3		53.80
17	4		53.80
18	5		53.77
19	6		53.75
20	7		53.79
21	8		53.66
22	9		53.77
23	10		53.76
27	14		53.70
7-05-77	22		53.71
08	25		53.60
15	32		53.59
19	36		53.51
26	43		53.49
8-02-77	50		53.43
12	60		53.35
22	70		53.23
26	74		53.12
30	78		53.25

TABLE 2. WATER LEVEL DATA FOR OBSERVATION WELL H (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
9-06-77	85		52.98
12	91		52.84
30	99		52.67
10-17-77	127		52.81
26	136		52.49
11-04-77	144		52.64
18	158		52.24
29	169		52.53
12-16-77	186		52.09
20	190		52.52
30	200		-
1-18-78	219		52.74
31	232		52.38
2-21-78	253		52.78
3-20-78	280		52.74
4-06-78	297		52.49
10	301		52.79
24	315		52.90
5-08-78	329	0	52.87
16	337	8	52.15
30	351	22	52.06
6-15-78	367	38	52.05

TABLE 2. WATER LEVEL DATA FOR OBSERVATION WELL H (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-27-78	379	50	52.22
9-08-78	452	123	52.24
21	465	136	51.73
10-03-78	477	148	51.59
16	490	161	51.29
25	499	170	51.02
11-07-78	512	183	51.14
12-08-78	543	214	50.34
19	554	225	50.40
28	563	234	50.54
1-17-79	583	254	50.72
31	597	268	50.82

TABLE 2. WATER LEVEL DATA FOR OBSERVATION WELL H (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
1-07-79	-	50.73
31	-	50.82
2-07-79	-	51.35
13	-	52.03
27	-	51.45
3-06-79	-	51.88
13	-	51.89
27	-	51.98
4-03-79	-	51.97
04	-	52.05
06	-	52.05
09	-	51.57
12	2	51.71
19	9	51.72
30	20	51.56
5-21-79	41	50.76
6-04-79	65	50.21
12	73	50.70
20	81	51.08
25	86	51.07
7-03-79	94	51.21
10	101	51.55
17	108	51.84
24	115	51.81
31	122	51.95
8-14-79	136	51.89
21	143	51.74
23	145	51.30
27	149	51.33
9-04-79	157	51.39
07	160	52.42
11	164	51.13
20	173	50.85
25	178	51.05
10-02-79	185	51.29
03	186	51.25
17	200	51.37
22	205	51.25

TABLE 2. WATER LEVEL DATA FOR OBSERVATION WELL H (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
11-06-79	220	51.03
13	227	50.68
26	240	50.24
12-05-79	249	50.53
13	257	50.98
19	263	50.74
1-17-80	292	50.70
21	296	50.65
29	304	50.55
2-04-80	310	50.64
18	324	50.56
28	328	50.57
3-08-80	337	50.70
17	346	51.05
4-03-80	363	50.90
5-21-80	411	51.34
27	417	51.44
6-06-80	427	51.53
12	433	51.62
24	445	51.25
7-02-80	453	51.90
17	468	51.45
21	472	51.46
28	479	51.18
8-18-80	500	51.46

TABLE 3. WATER LEVEL DATA FOR OBSERVATION WELL SUB-1

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-13-77	0		48.40
14	1		48.05
15	2		47.97
16	3		47.84
17	4		47.77
18	5		47.76
20	7		47.71
27	14		47.86
7-05-77	22		47.78
12	29		47.56
19	36		47.51
26	43		47.37
8-02-77	50		47.38
09	57		47.34
15	63		47.22
22	70		47.59
30	78		47.22
9-12-77	91		46.68
10-10-77	120		46.20
17	127		46.84
26	136		45.92
11-01-77	141		46.36

TABLE 3. WATER LEVEL DATA FOR OBSERVATION WELL SUB-1 (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
11-22-77	162		45.78
12-06-77	176		46.21
13	183		45.70
20	190		46.78
30	200		-
1-18-78	219		46.98
31	232		47.20
2-07-78	239		47.10
21	253		47.57
3-03-78	263		47.27
08	268		47.59
20	280		47.44
28	288		48.62
4-06-78	297		47.60
18	309		47.29
24	315		47.47
5-08-78	329	0	47.44
23	344	15	45.95
30	351	22	46.10
6-05-78	357	28	46.07
27	379	50	46.43
7-06-78	388	59	47.02

TABLE 3. WATER LEVEL DATA FOR OBSERVATION WELL SUB-1 (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
7-18-78	400	71	46.84
27	409	80	46.97
8-09-78	422	93	46.63
16	429	100	46.82
9-27-78	471	142	45.44
10-03-78	477	148	45.81
16	490	161	45.71
25	499	170	45.05
11-07-78	512	183	44.90
13	518	189	45.64
28	533	204	44.93
12-19-78	554	225	44.14
28	563	234	44.80
1-17-79	583	254	45.11
31	597	268	45.19

TABLE 3. WATER LEVEL DATA FOR OBSERVATION WELL SUB-1 (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
1-11-79	-	44.99
17	-	45.11
31	-	45.19
2-07-79	-	46.09
13	-	46.85
20	-	46.71
27	-	46.77
3-06-79	-	47.22
13	-	47.18
27	-	47.14
4-03-79	-	47.30
04	-	47.40
06	-	47.47
09	-	47.11
12	2	46.80
19	9	46.60
30	20	45.42
5-08-79	28	45.30
14	34	45.22
21	41	45.17
29	49	45.07

TABLE 4. WATER LEVEL DATA FOR OBSERVATION WELL SUB-2

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-13-77	0		57.52
14	1		57.46
15	2		57.54
16	3		57.40
17	4		57.35
18	5		57.33
20	7		57.29
27	14		57.25
7-05-77	22		57.30
12	29		57.10
19	36		57.04
26	43		56.99
8-02-77	50		56.91
09	57		56.89
15	63		56.88
22	70		56.70
30	78		56.71
9-12-78	91		56.37
10-10-78	120		56.08
17	127		56.29
26	136		55.84
11-01-77	141		56.09

TABLE 4. WATER LEVEL DATA FOR OBSERVATION WELL SUB-2 (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
11-08-77	148		56.17
15	155		55.67
22	162		55.74
12-06-77	176		55.81
13	183		55.63
20	190		55.88
28	198		45.68
30	200		-
1-10-78	211		55.88
18	219		56.19
31	232		56.18
2-16-78	248		56.21
21	253		56.56
3-03-78	263		56.34
08	268		56.61
28	288		56.54
4-06-78	297		56.30
10	301		56.59
24	315		56.68
5-08-78	329	0	56.66
30	351	22	55.78
6-05-78	357	28	55.72

TABLE 4. WATER LEVEL DATA FOR OBSERVATION WELL SUB-2 (Cont'd)

DATE	TIME SINCE INJECTION STARTED FIRST TIME (t_1 days)	TIME SINCE INJECTION RESTARTED SECOND TIME (t_2, days)	WATER LEVEL (FT-MP)
6-27-78	379	50	55.97
7-06-78	388	59	56.21
18	400	71	56.16
27	409	80	56.23
8-09-78	422	93	56.05
16	429	100	56.06
9-27-78	471	142	55.22
10-03-78	477	148	55.32
25	499	170	54.83
11-07-78	512	183	54.77
13	518	189	55.10
28	533	204	54.74
12-19-78	554	225	54.17
28	563	234	54.42
1-17-79	583	254	53.56
31	597	268	54.60

TABLE 4. WATER LEVEL DATA FOR OBSERVATION WELL SUB-2 (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
1-07-79	-	54.47
11	-	54.39
17	-	54.56
31	-	54.60
2-07-79	-	55.13
13	-	55.67
20	-	55.60
27	-	55.53
3-06-79	-	56.00
13	-	55.67
27	-	56.07
4-03-79	-	56.09
04	-	56.16
06	-	56.17
09	-	55.85
12	2	55.78
19	9	55.75
30	20	54.98
5-08-79	28	54.90
14	34	54.79
21	41	54.76
29	49	54.34
6-04-79	55	54.14
12	61	55.10
20	69	54.98
25	74	55.20
7-03-79	82	55.19
10	89	55.54
17	96	55.94
24	103	55.83
31	110	56.06
8-14-79	134	56.24
23	143	55.70
9-04-79	155	55.37
07	158	56.51
11	162	55.16
10-02-79	183	55.34
17	198	55.23
22	203	55.27

TABLE 4. WATER LEVEL DATA FOR OBSERVATION WELL SUB-2 (cont'd)

DATE	TIME SINCE INJECTION STARTED THIRD TIME (t_3, days)	WATER LEVEL (ft/MP)
11-06-79	218	54.50
13	225	54.39
26	238	54.44
12-05-79	247	54.53
13	255	54.87
19	261	54.69
1-17-80	290	54.65
21	294	54.61
29	302	54.50
2-04-80	308	54.60
18	322	54.55
28	332	54.60
3-08-80	341	54.65
17	350	54.97
4-03-80	367	54.80
5-21-80	415	55.27
27	421	55.43
6-06-80	431	55.70
12	437	55.58
24	449	55.15
7-02-80	457	55.27
17	472	55.28
21	476	49.40 (?)
28	483	54.90
8-18-80	504	55.32

TABLE 5. WATER LEVEL DATA FOR OBSERVATION WELL SUB-3

DATE	TIME SINCE INJECTION STARTED FIRST TIME (DAYS)	WATER LEVEL (FT-MP)
6-13-77	0	-
7-20-77	37	45.38
7-27-77	44	45.22
8-2-77	50	45.64
8-12-77	60	45.56
8-16-77	64	45.60
8-22-77	70	45.91
8-24-77	72	43.45
8-30-77	78	43.48
9-7-77	86	43.00
9-13-77	92	42.92
9-21-77	101	43.02
9-28-77	108	42.89
10-4-77	114	42.84
10-12-77	122	43.19
10-31-77	141	43.12

TABLE 7. CONCENTRATIONS BEFORE INJECTION AND NOW* FOR EACH CONSTITUENT FROM THE BROADVIEW ACRES WELLS

WELL NO.	SULFATE		SODIUM		BICAR-BONATE		NITRATE		URANIUM		SELENIUM		MOLYB-DENUM		RADIUM	
	**Then	*Now	Then	Now	Then	Now	Then	Now	Then	Now	Then	Now	Then	Now	Then	Now
H	1569	1057	350	280	-	-	-	-	0.10	<.01	0.05	0.09	0.02	0.04	-	-
Sub-1	1755	1516	550	550	619	472	16.0	11.6	0.42	1.19	0.13	0.36	0.05	0.22	2.5	1.1
Sub-2	1450	2024	415	490	832	315	5.1	2.0	0.01	<.01	0.57	1.51	0.01	0.02	2.5	1.7
Sub-3	2255	910	595	420	675	456	17.5	8.0	6.8	1.70	0.83	0.07	0.01	0.11	2.2	0.9
Sub-4	1730	651	495	250	406	510	9.0	1.1	0.12	<.01	0.66	<.01	0.02	0.05	3.7	1.2
Sub-5	2900	1943	860	580	1180	910	6.0	5.9	24.3	12.9	1.45	1.54	5.65	6.41	2.0	0.3
Sub-6	2150	1255	515	400	530	456	9.5	5.55	0.4	3.9	0.50	0.7	0.05	0.06	4.4	1.1
Sub-7	1330	1513	350	360	320	189	9.2	7.25	0.85	<.01	0.44	1.25	0.03	0.05	4.2	0.3
Sub-8	1325	2116	408	520	460	449	4.5	5.7	0.31	3.5	0.46	1.32	0.02	0.43	4.4	1.3

* NOW refers to August, 1980, except for Sub-1, which was last sampled April 30, 1979.

** Then - before injection started

TABLE 6. MAXIMUM CONCENTRATIONS OF THE BACKGROUND WATER (WELLS P, Q OR R), MAXIMUM CONCENTRATIONS OF THE INJECTION WATER (DEEP WELL 2), AND THE DRINKING GROUND-WATER STANDARDS

CONSTITUENT	MAXIMUM BACKGROUND CONCENTRATION	MAXIMUM INJECTION CONCENTRATION	GROUND WATER STANDARDS	MAXIMUM CONCENTRATION BEFORE INJECTION	MAXIMUM CONCENTRATION @ 8/80
So_4	1300 1280@	680	600	2900	2116
Na	350 340@	250	-	860	580
HCO_3	540 540@	553	-	1180	910
NO_3 as N	28.5 27.2@	2.1	10	17.5	7.25
U	0.72 0.17@	0.19 0.12@	5	24.3	12.9
Se	0.30 0.23@	0.08 0.05@	0.05	1.45	1.54
Mo	0.20 0.10@	0.13 0.11@	-	5.65	6.41
Ra_{226}	4.9 4.7@	2.9	30	4.4	1.7

NOTE: Concentrations in mg/l, except Ra_{226} in pCi/l @ = second highest

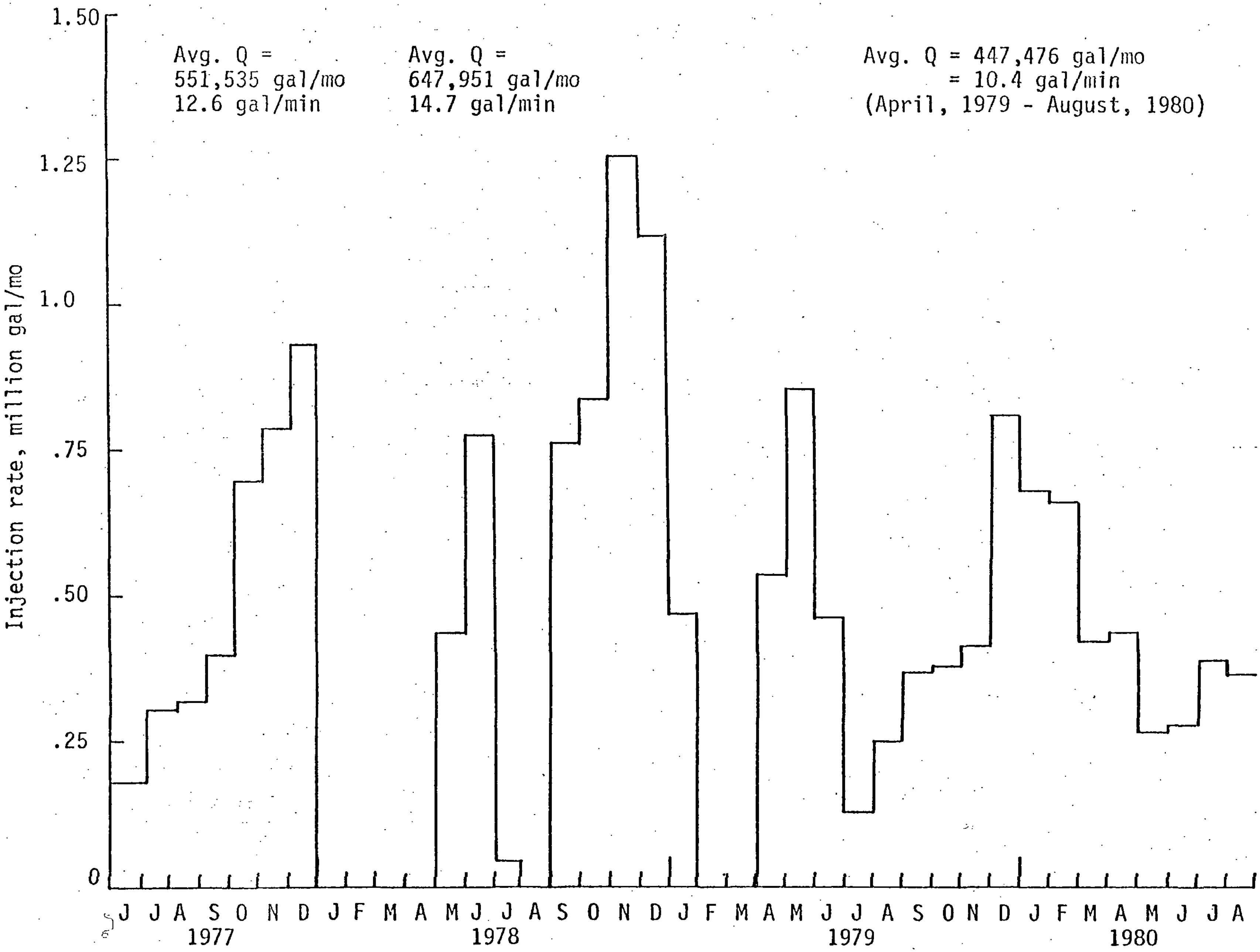


FIGURE 1. MONTHLY INJECTION RATES FOR WELL G

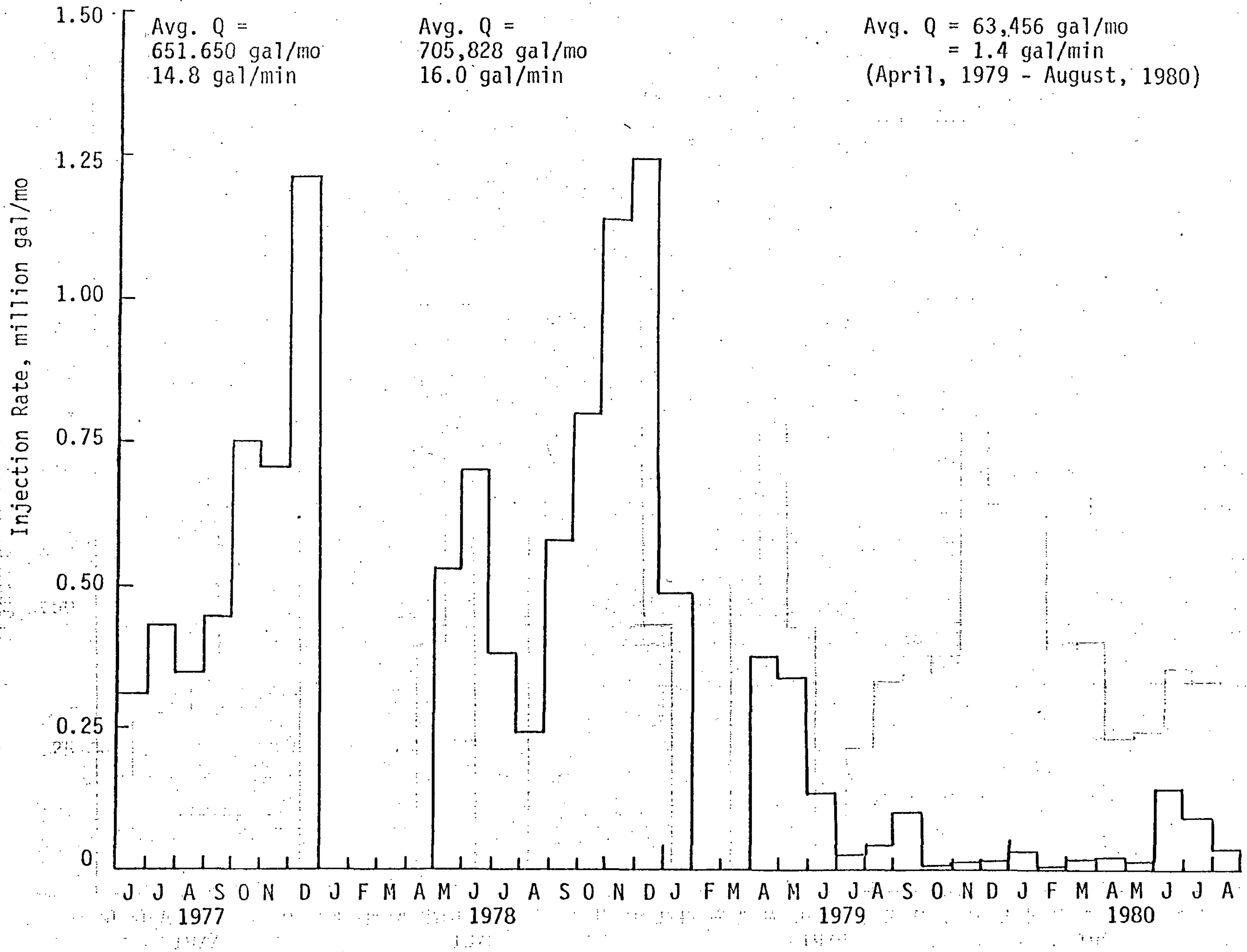


FIGURE 2. MONTHLY INJECTION RATES FOR WELL GG

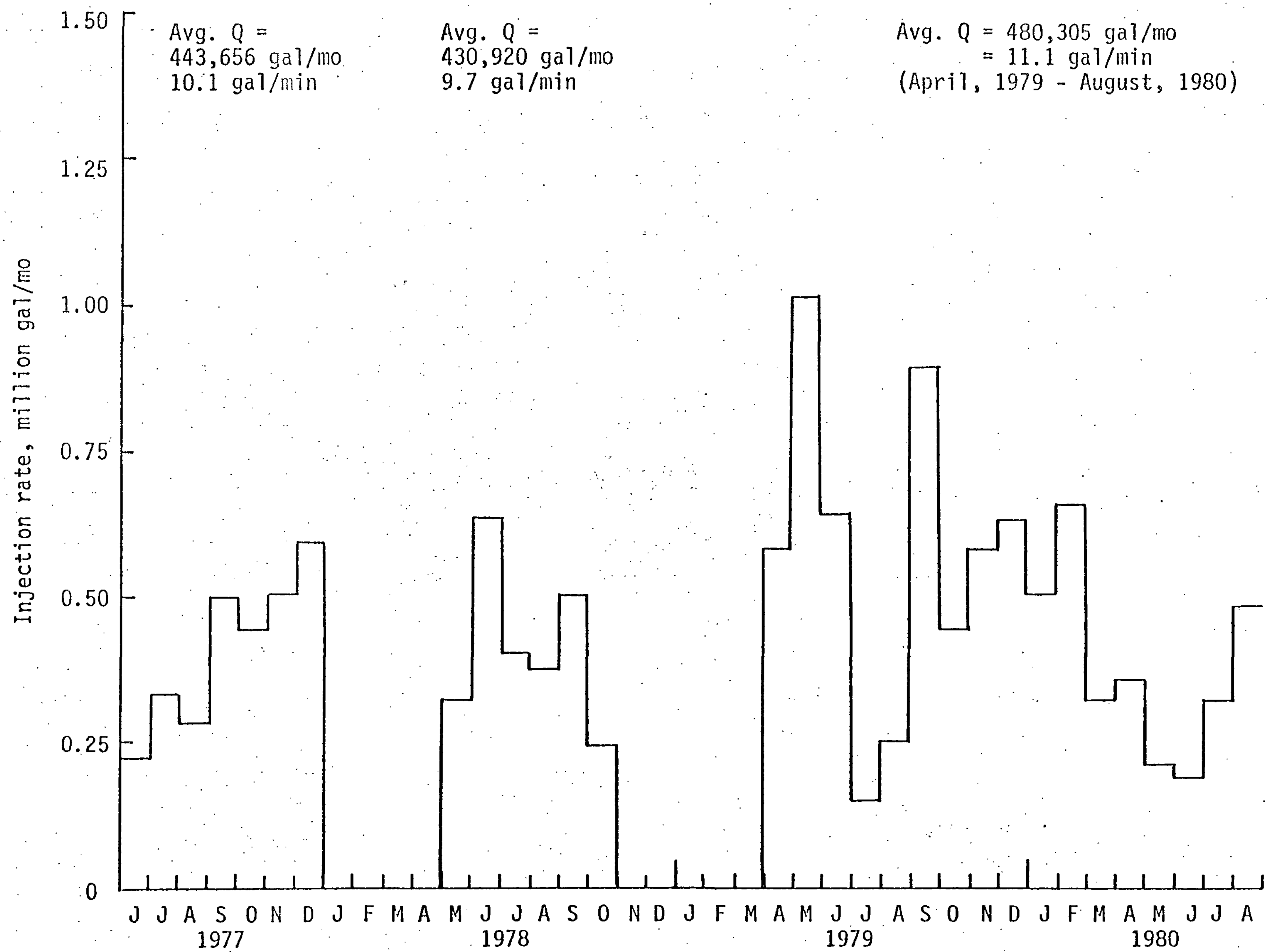


FIGURE 3. MONTHLY INJECTION RATES FOR WELL GA

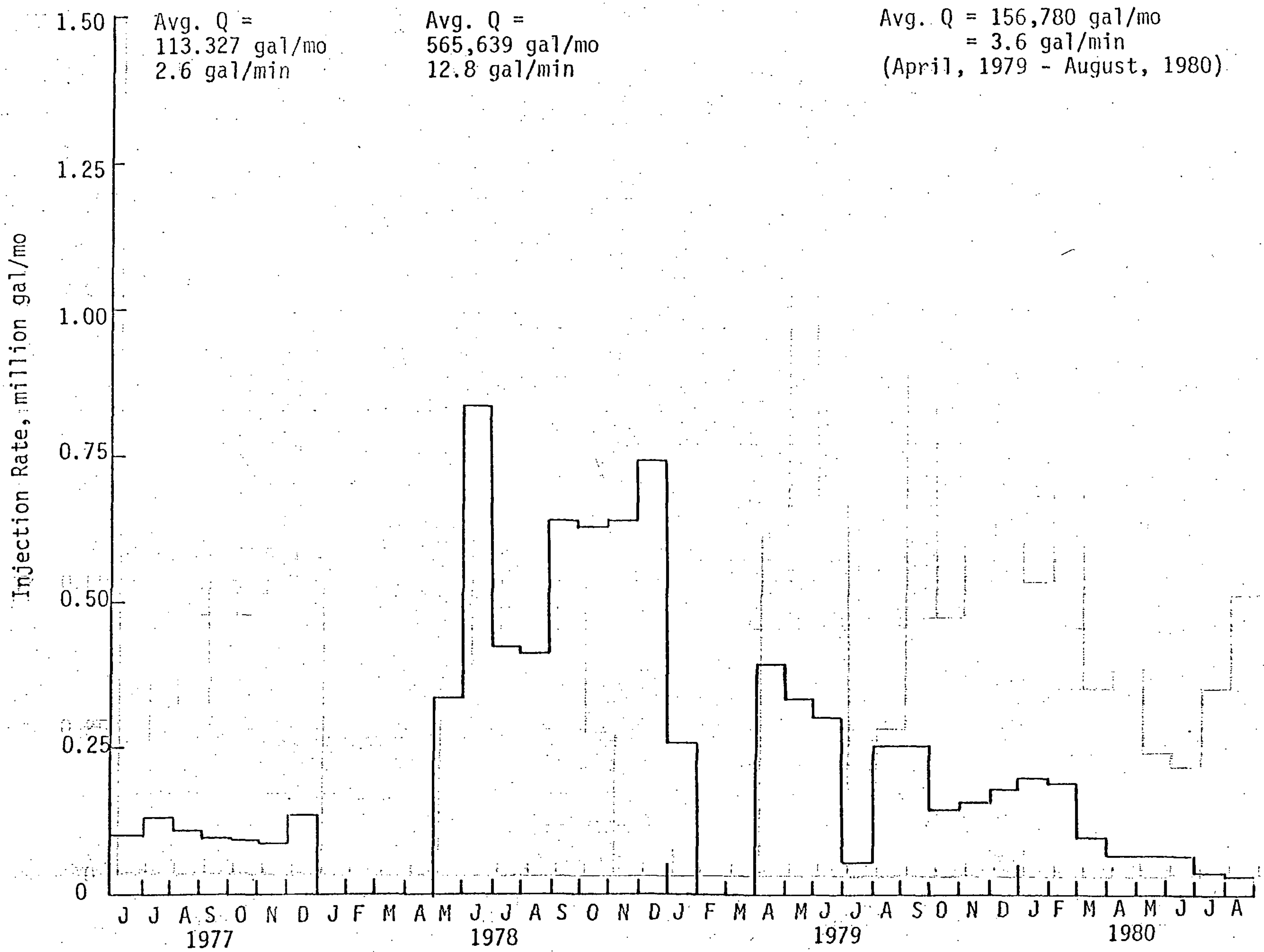


FIGURE 4. MONTHLY INJECTION RATES FOR WELL GB

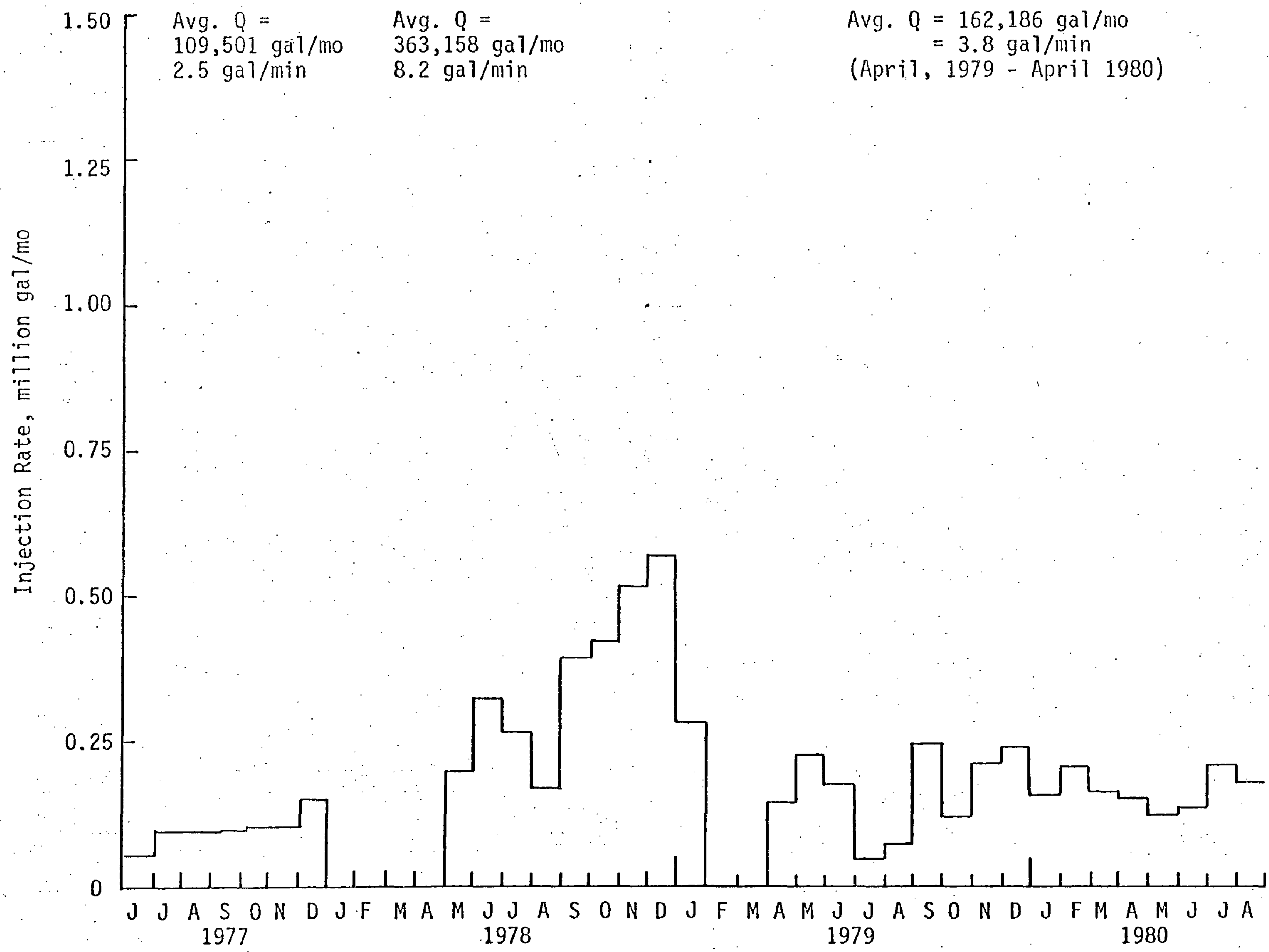


FIGURE 5. MONTHLY INJECTION RATES FOR WELL GC

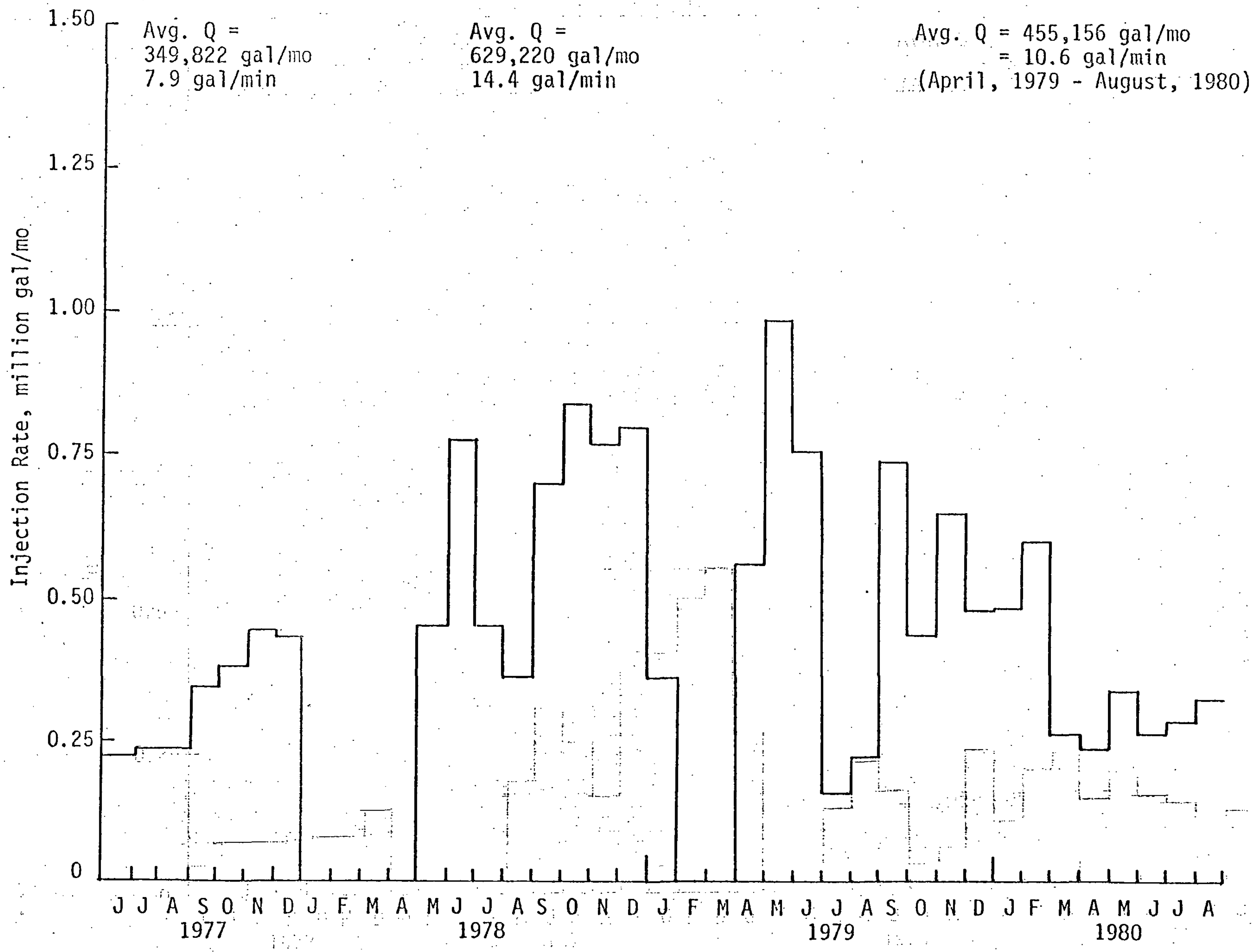


FIGURE 6. MONTHLY INJECTION RATES FOR WELL GD

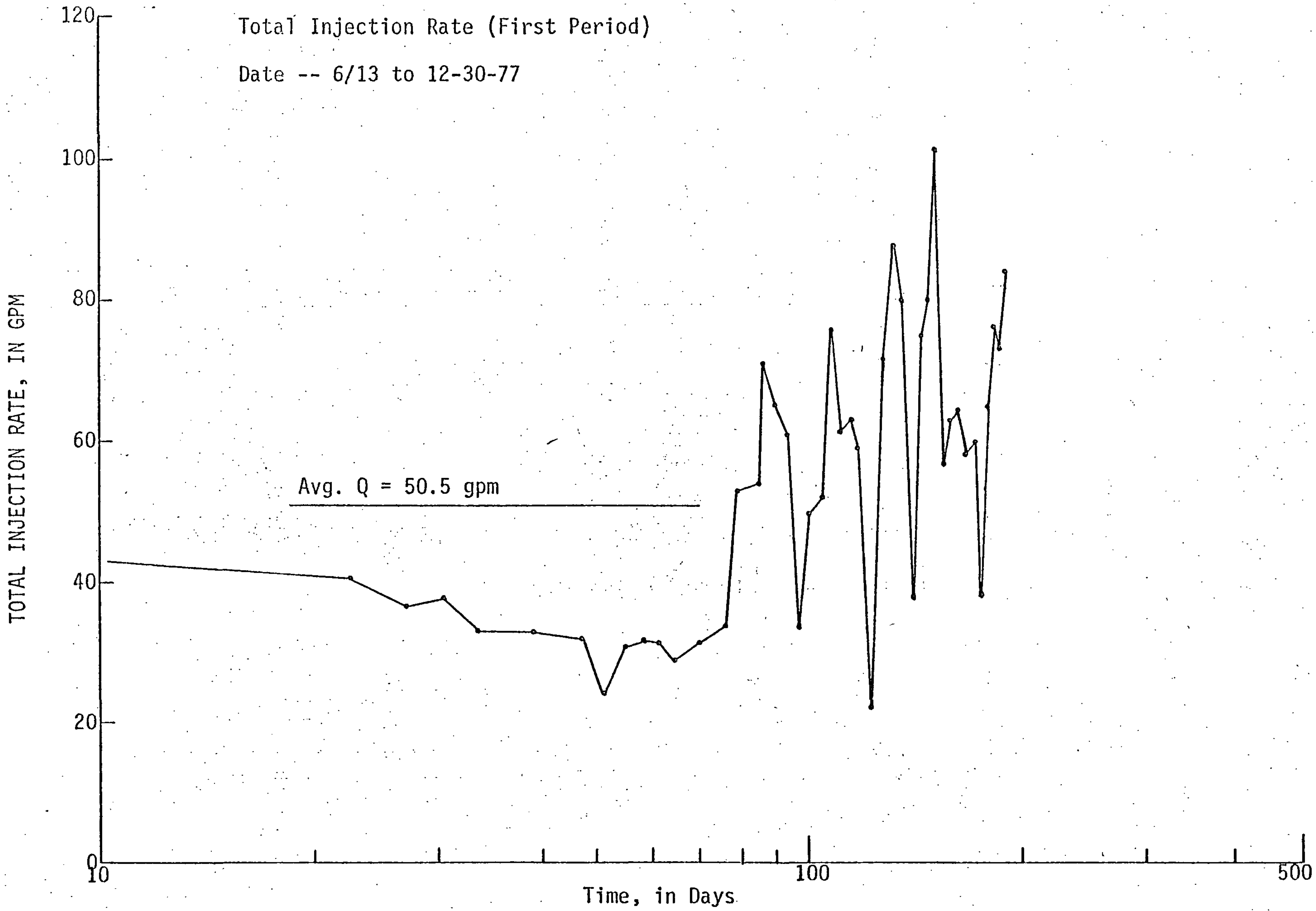


FIGURE 7. TOTAL INJECTION RATE FOR WELLS G, GG, GA, GB, GC AND GD, 6/13 - 12/30/77

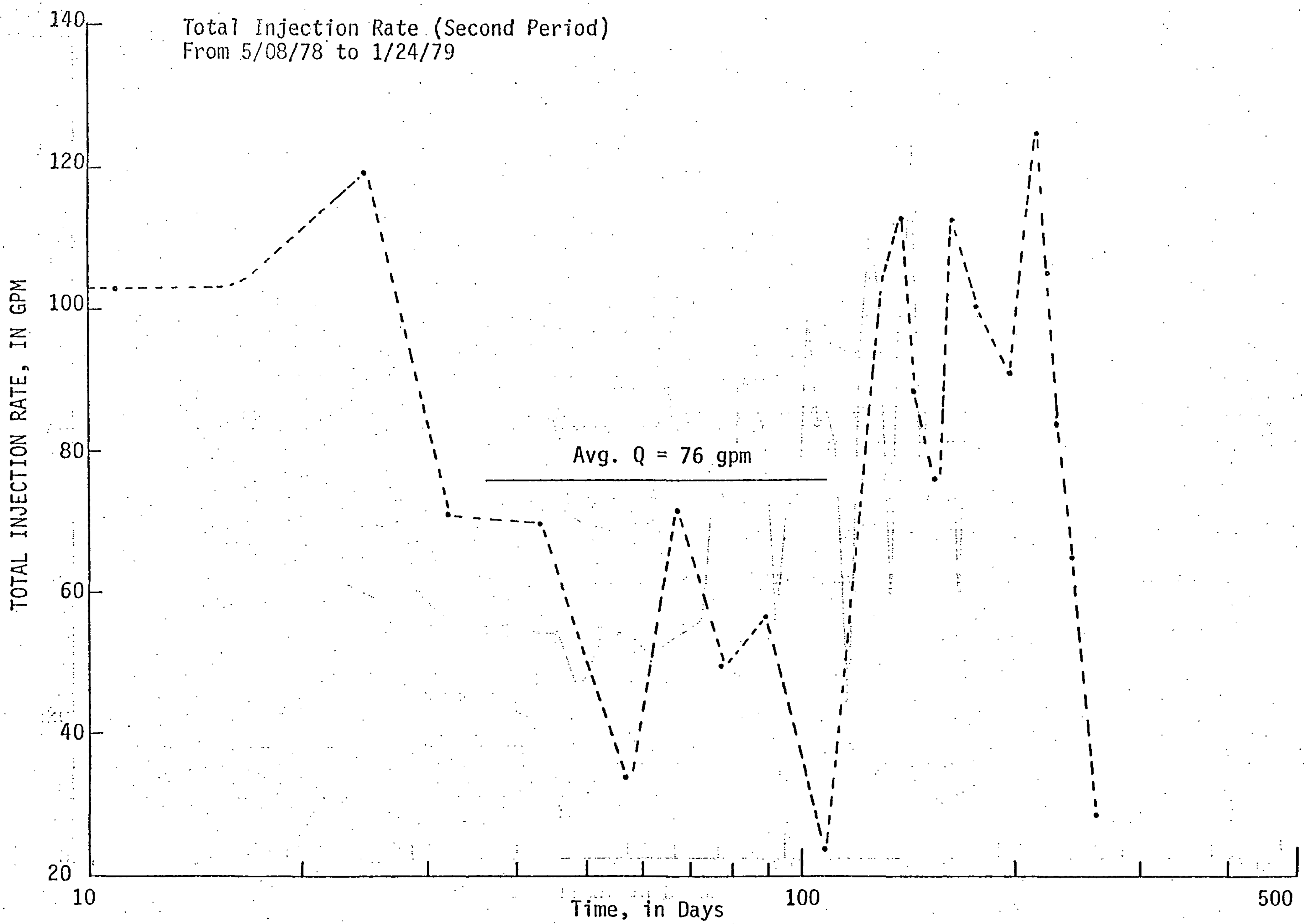


FIGURE 8. TOTAL INJECTION RATE FOR WELLS G, GG, GA, GB, GC AND GD, 5/08/78 - 1/24/79

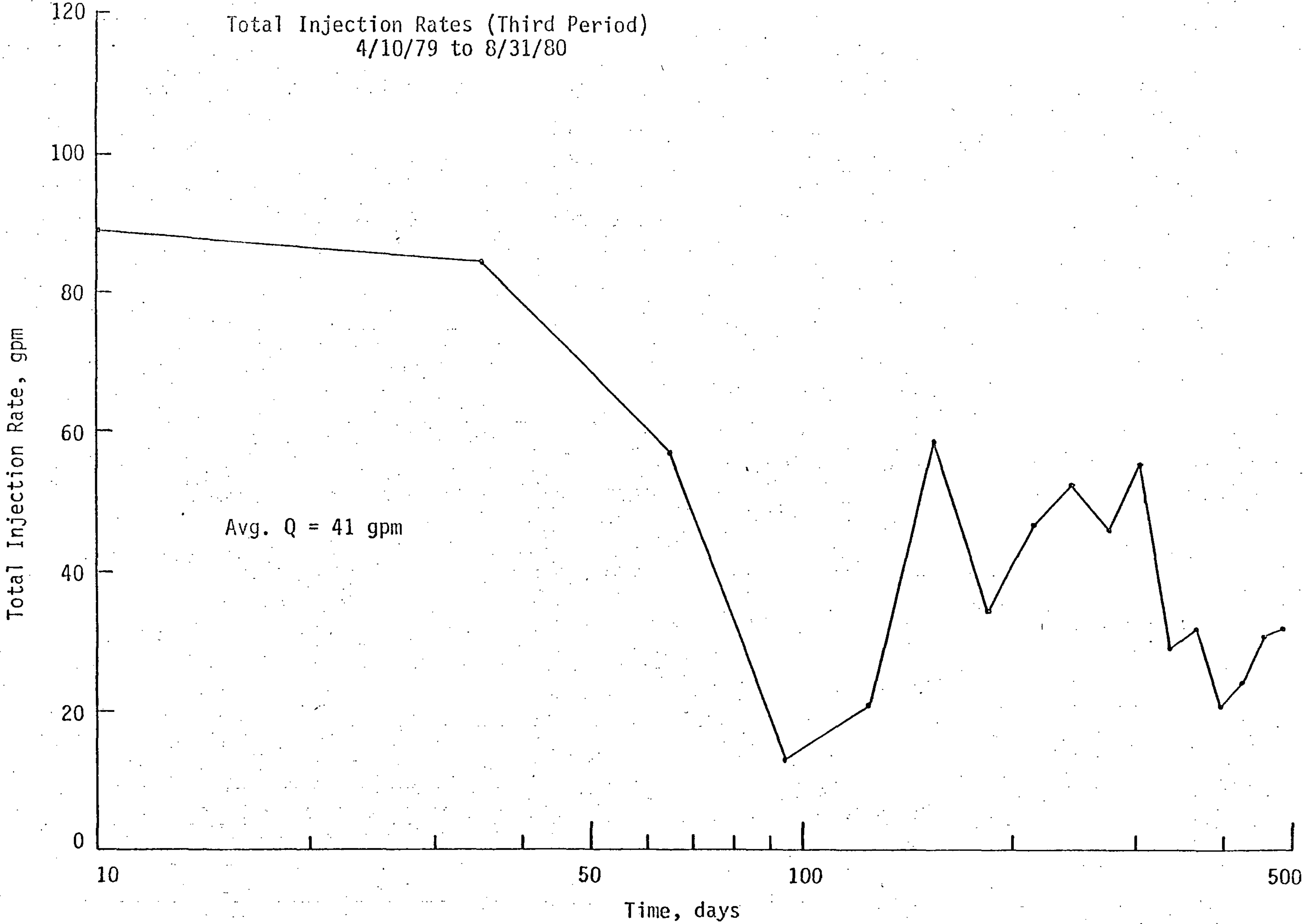


FIGURE 9. TOTAL INJECTION RATE FOR WELLS G, GG, GA, GB, GC AND GD, 4/10/79-8/31/80

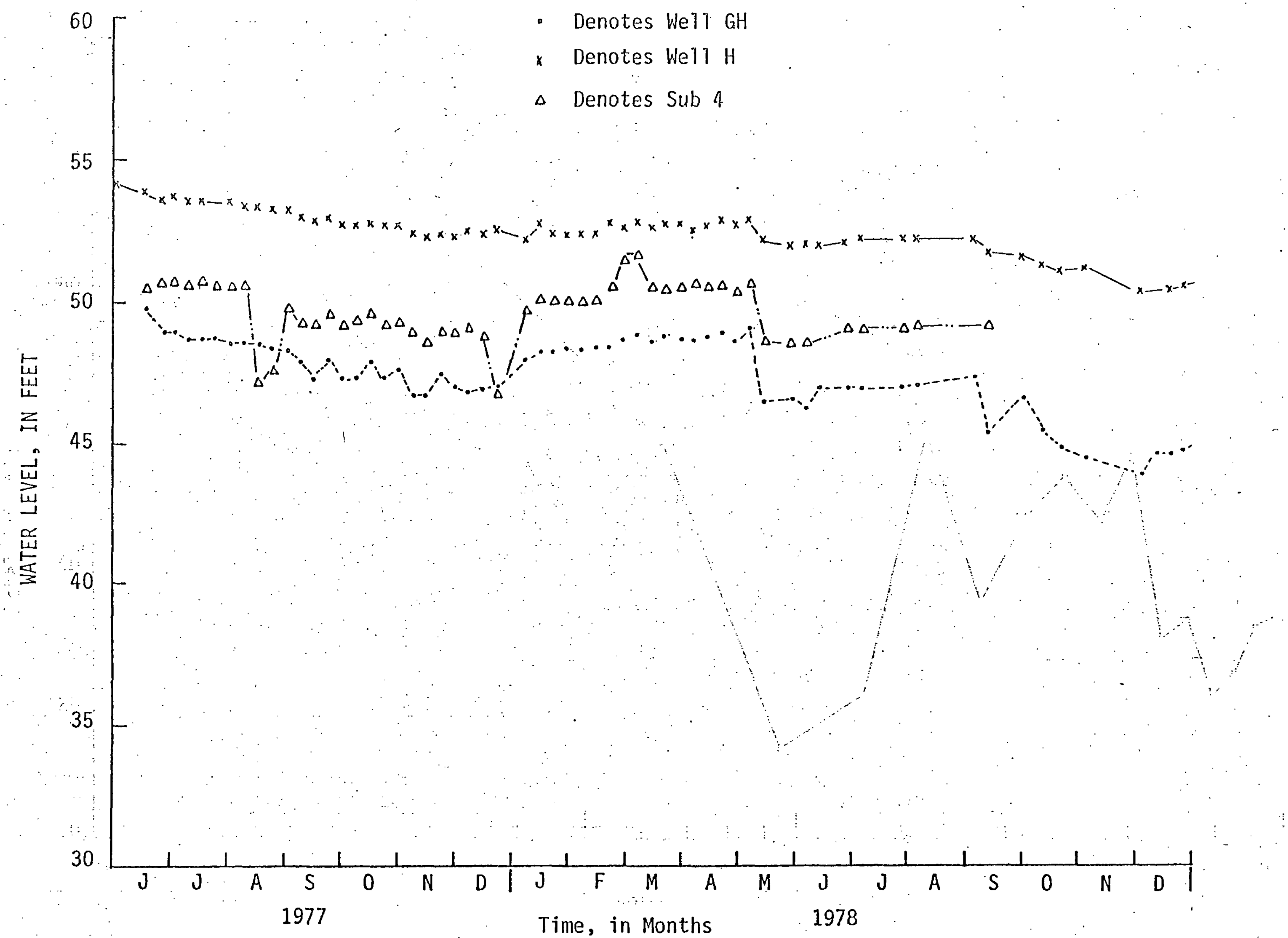


FIGURE 10. WATER LEVELS FOR WELLS GH, H AND SUB 4 (1977 & 1978)

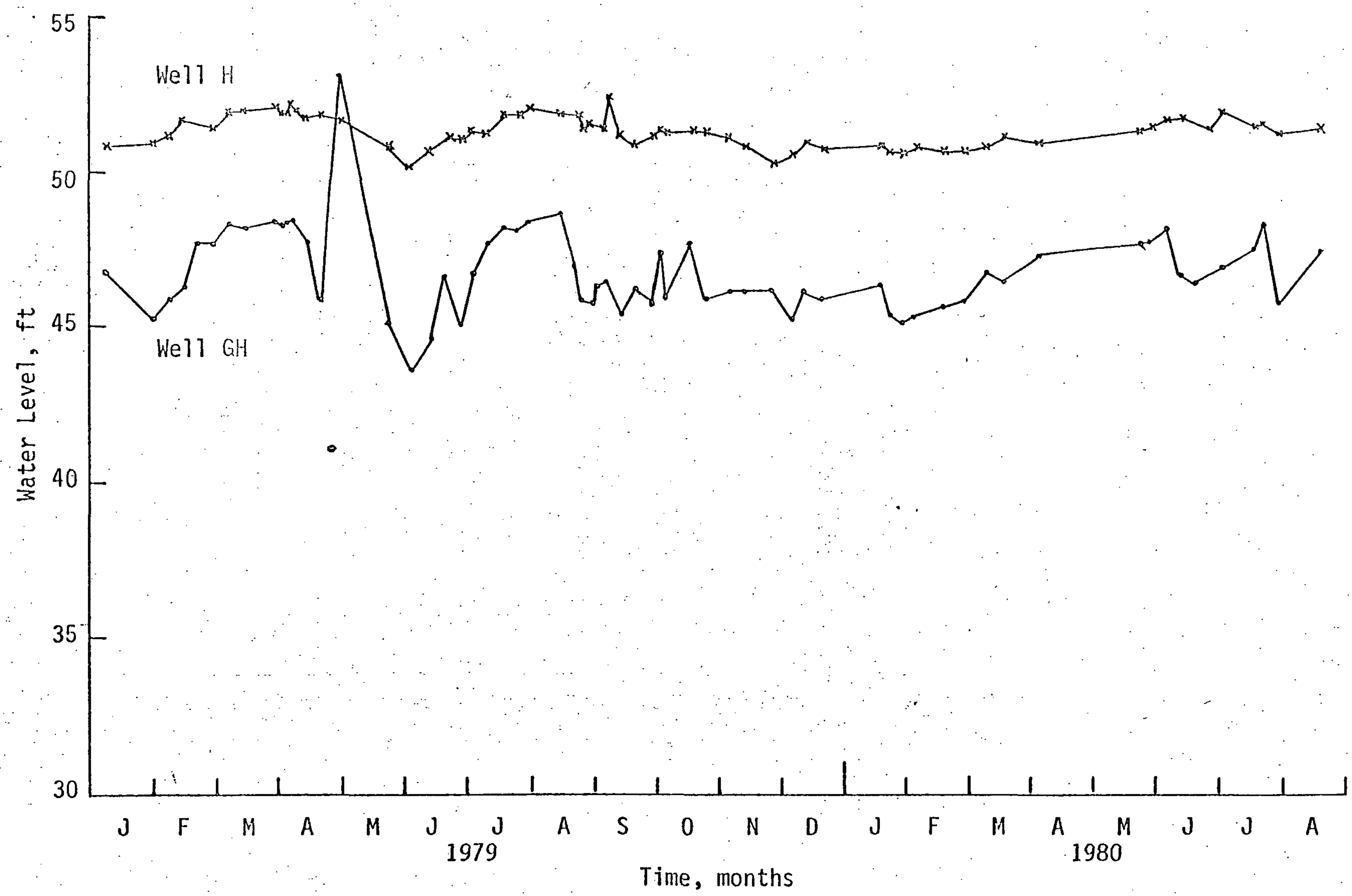


FIGURE 11. WATER LEVELS FOR WELLS GH AND H (1979-1980)

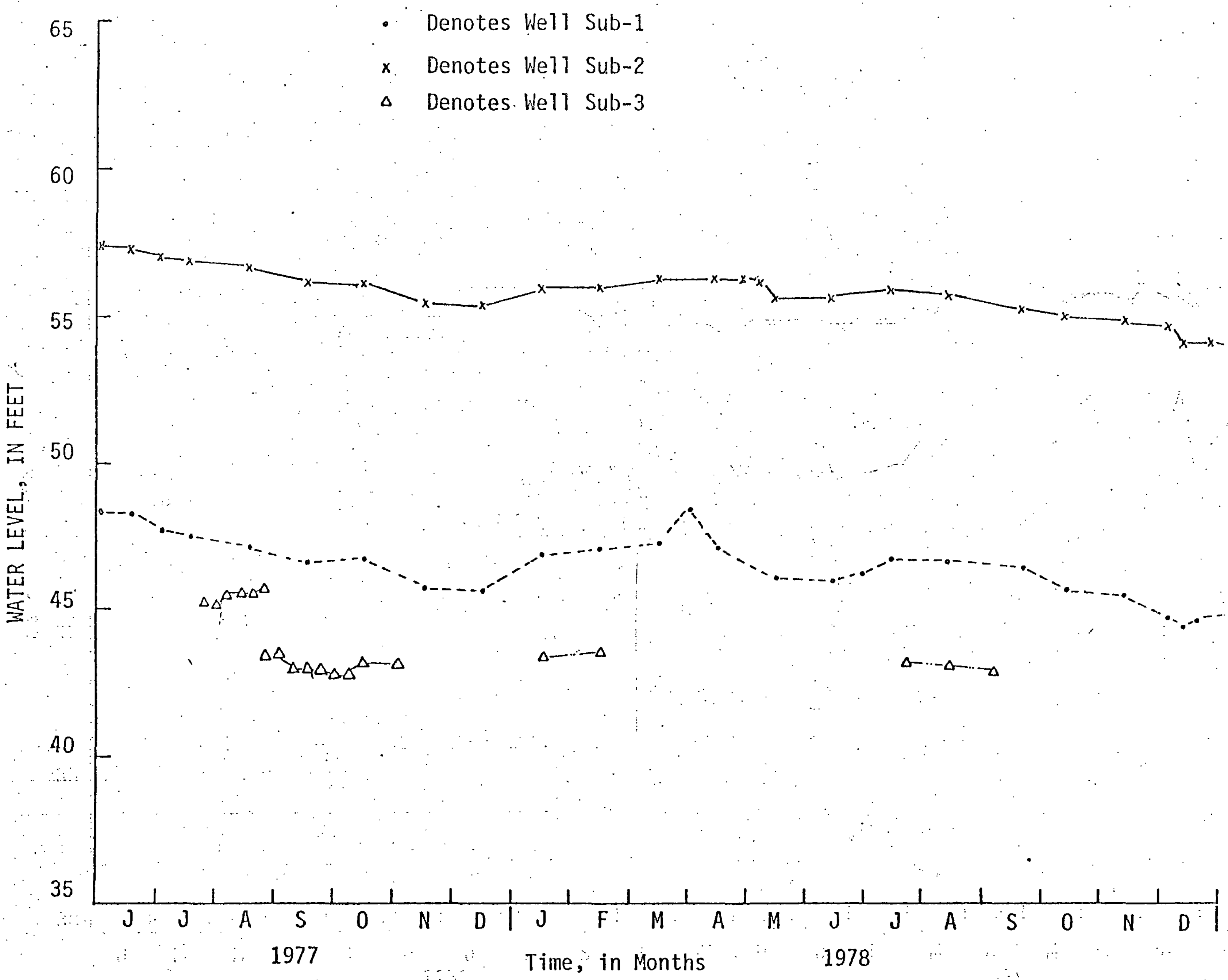


FIGURE 12. WATER LEVELS FOR WELLS SUB-1, SUB-2, AND SUB-3 (1977 & 1978)

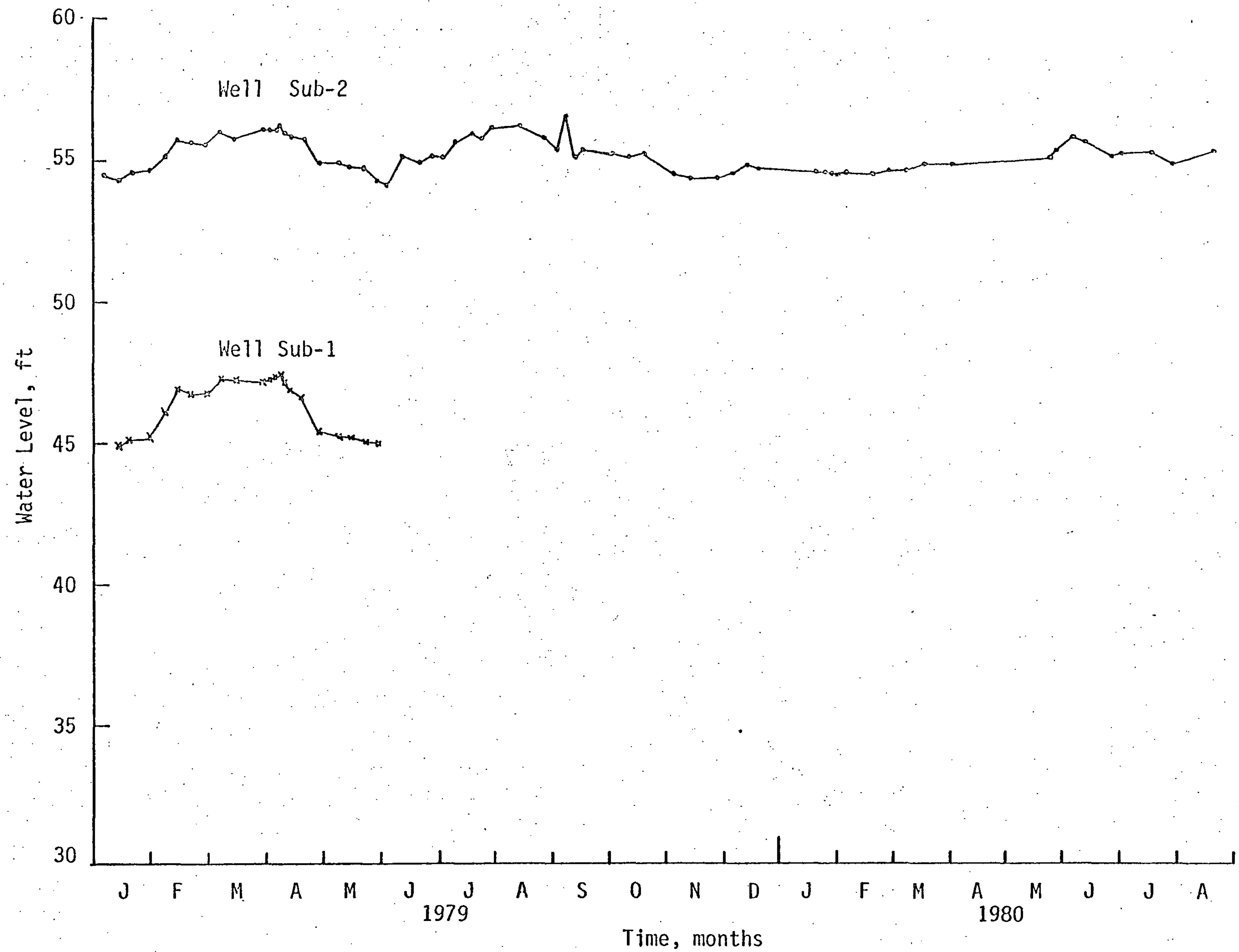


FIGURE 13. WATER LEVEL FOR WELLS SUB-1 AND SUB-2 (1979 & 1980)

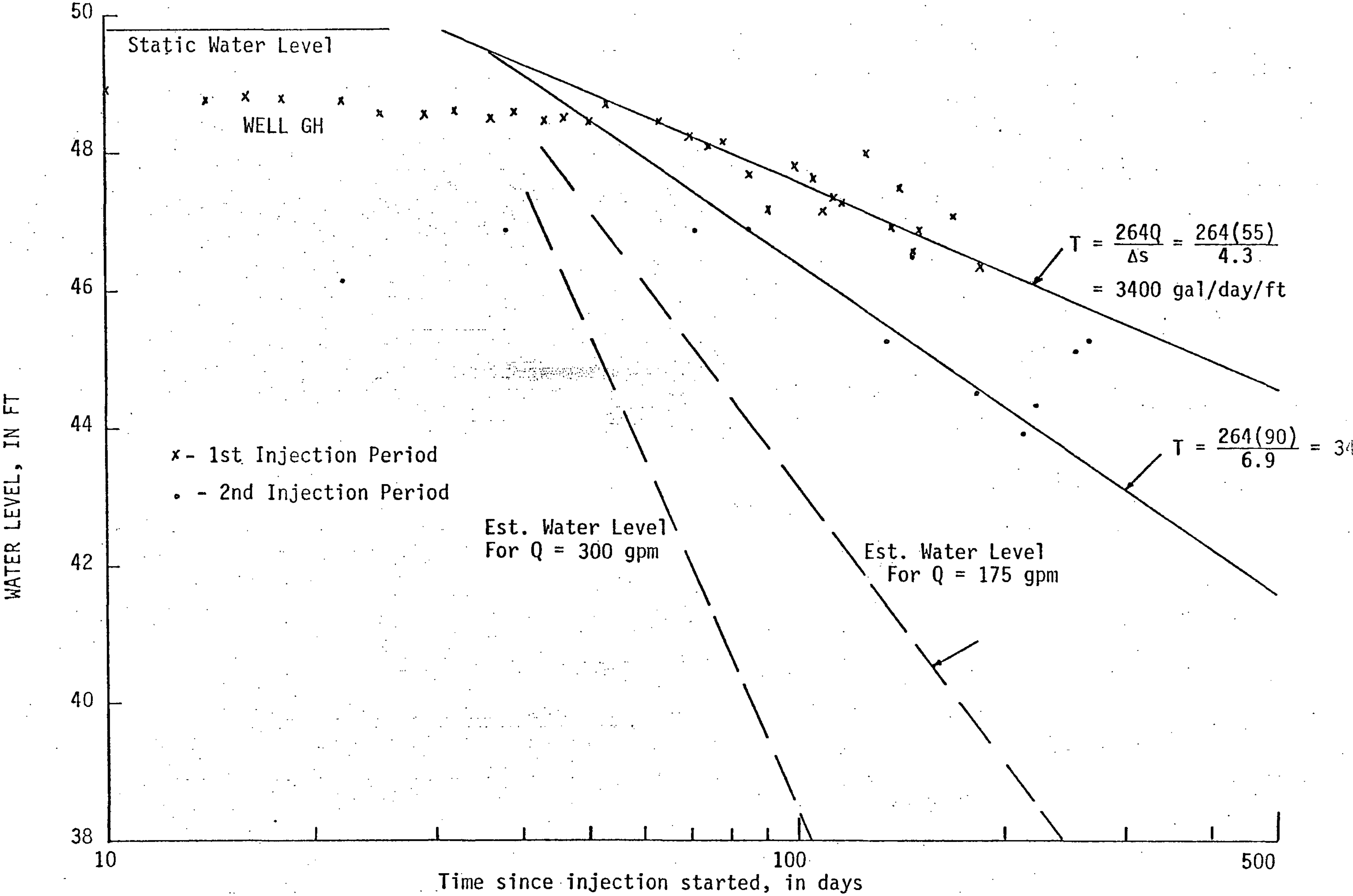


FIGURE 14. WATER LEVELS IN WELL GH AND PREDICTED WATER LEVEL FOR INJECTION RATES OF 175 AND 300 GPM

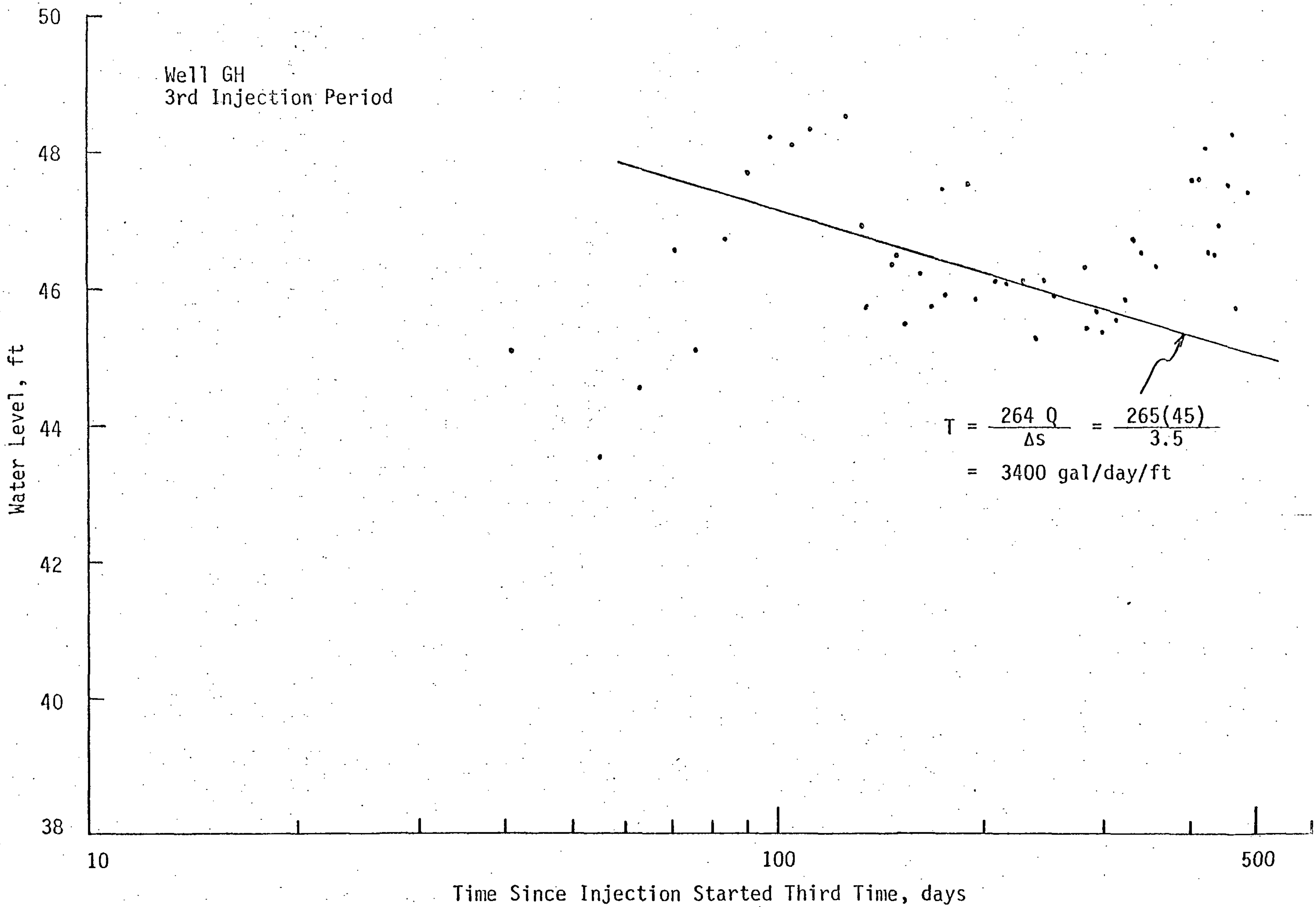


FIGURE 15 WATER LEVELS IN WELL GH (THIRD INJECTION)

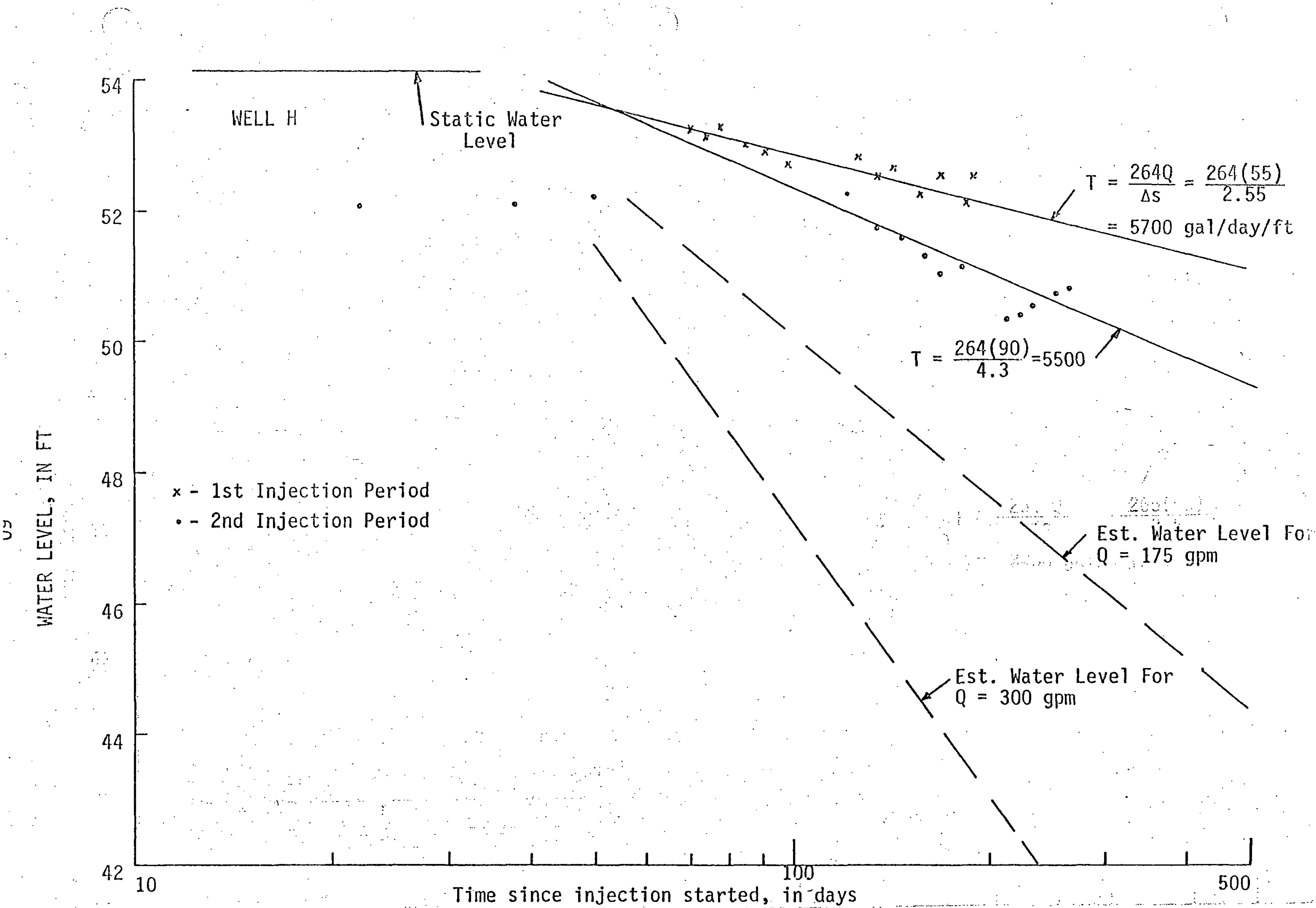


FIGURE 16. WATER LEVELS IN WELL H AND PREDICTED WATER LEVEL FOR INJECTION RATES OF 175 AND 300 GPM

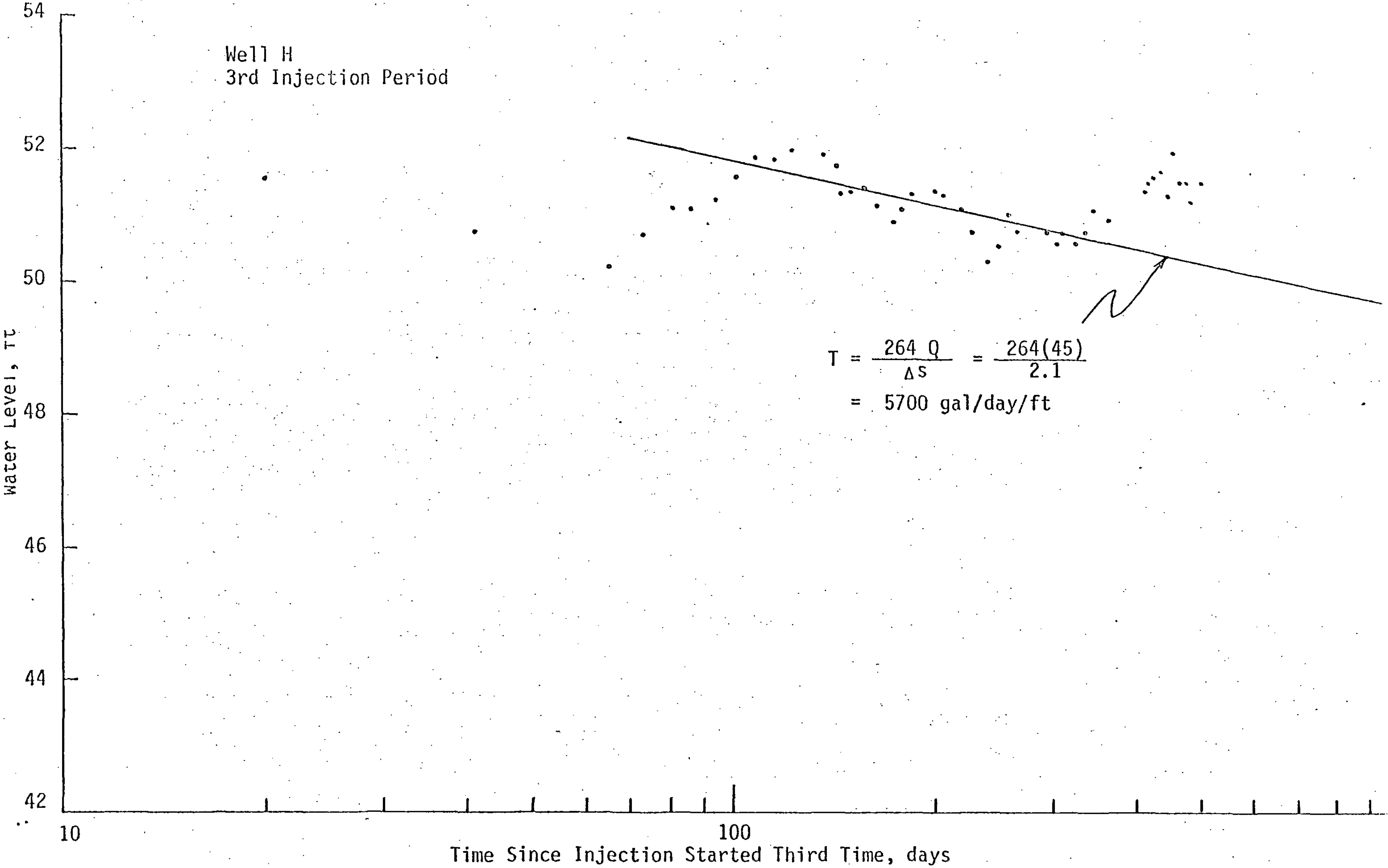


FIGURE 17. WATER LEVELS IN WELL H (THIRD INJECTION)

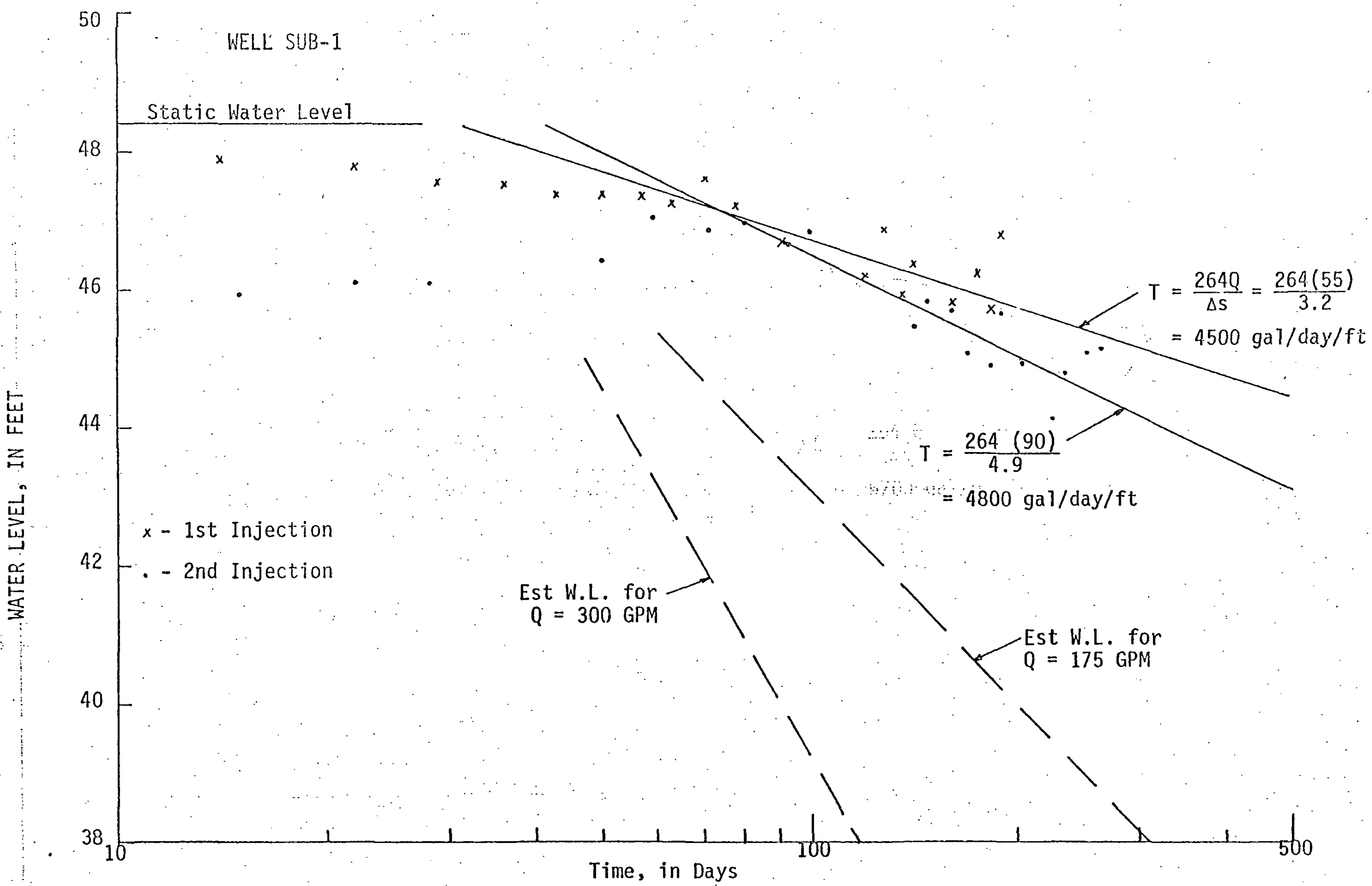


FIGURE 18. WATER LEVELS IN WELL SUB-1 AND PREDICTED WATER LEVEL FOR INJECTION RATES OF 175 and 300 GPM

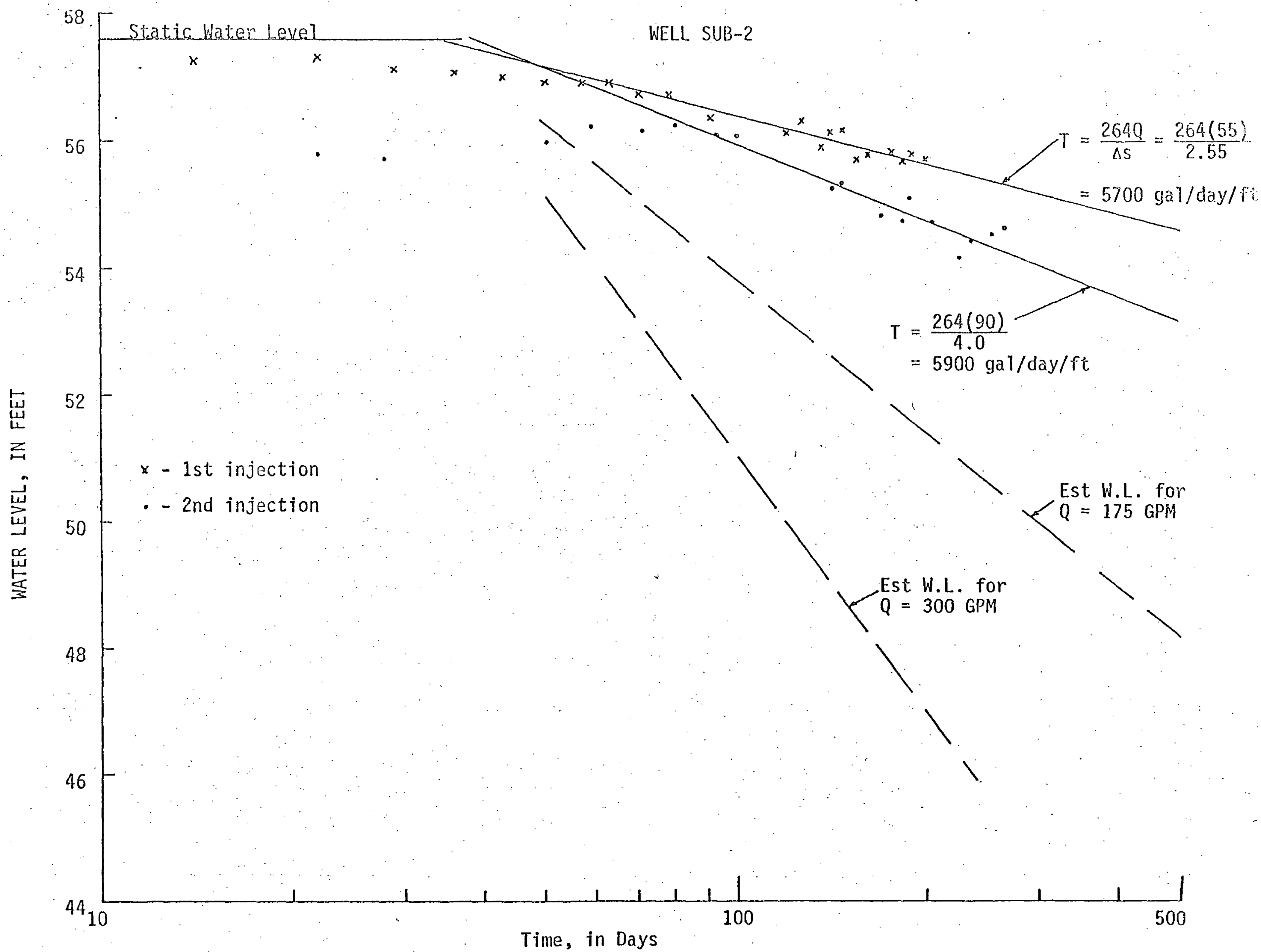


FIGURE 19. WATER LEVELS IN WELL SUB-2 AND PREDICTED WATER LEVEL FOR INJECTION RATES OF 175 AND 300 GPM

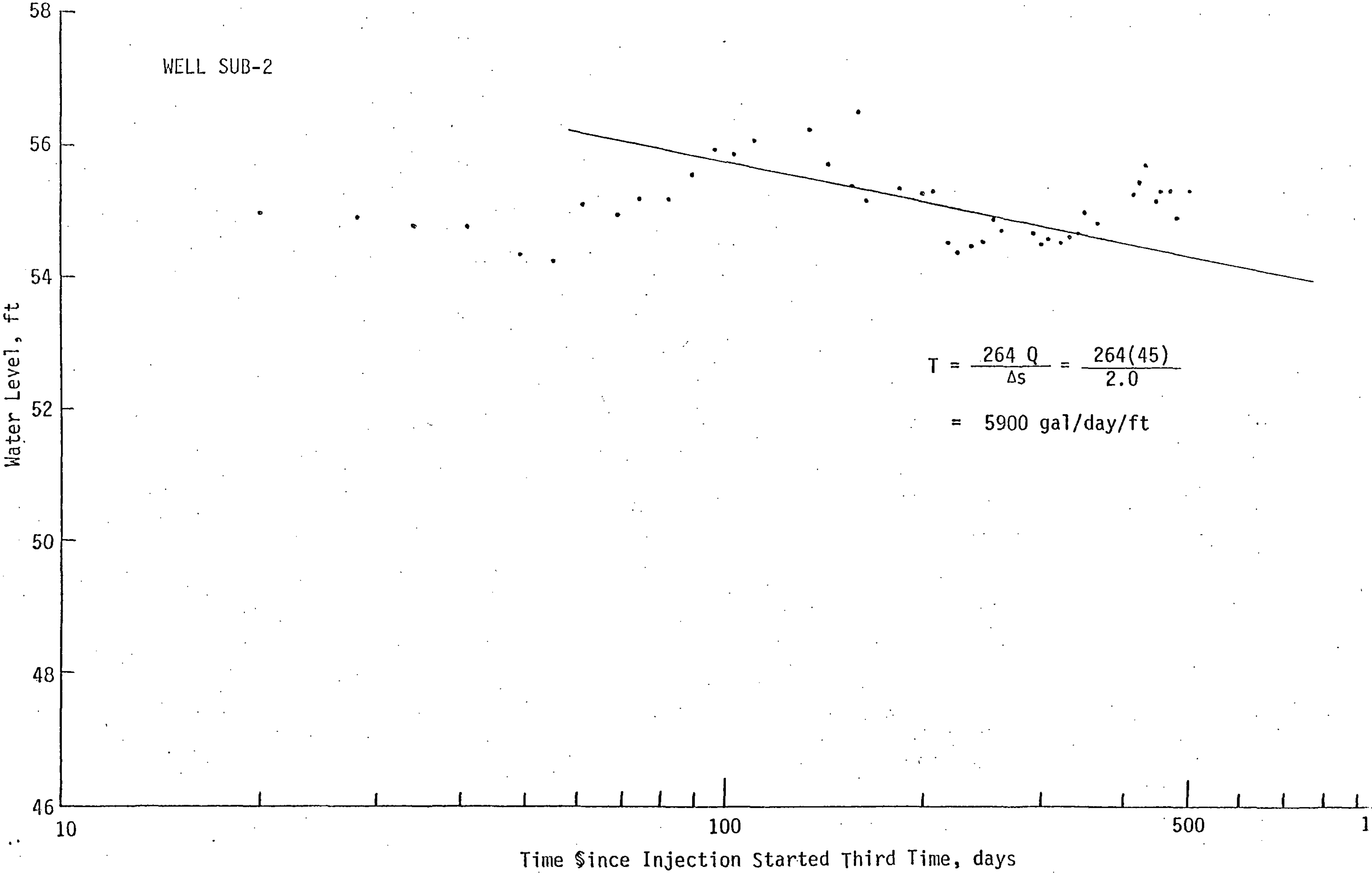


FIGURE 20. WATER LEVELS IN WELL SUB-2 (THIRD INJECTION)

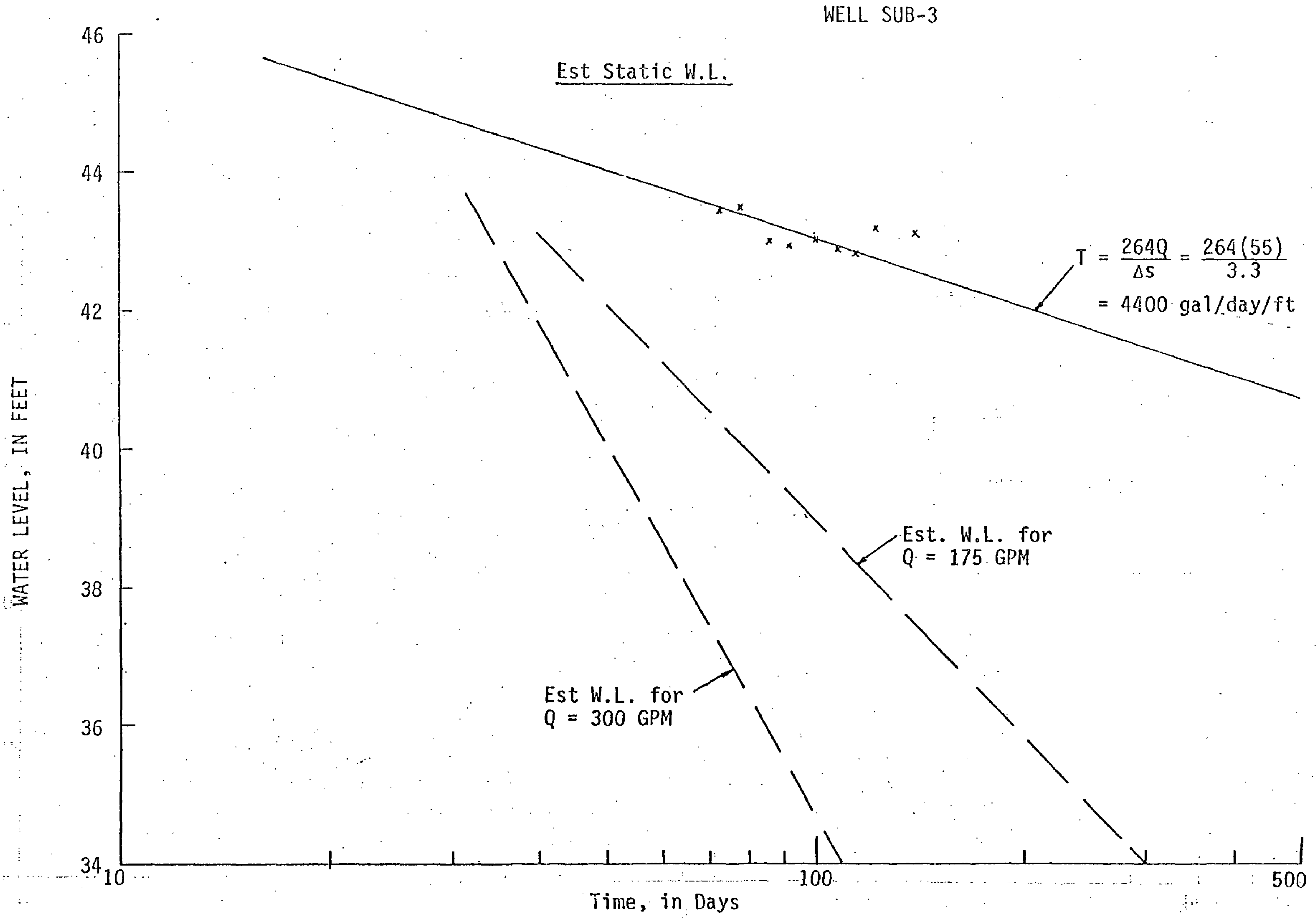


FIGURE 21. WATER LEVELS IN WELL SUB-3 AND PREDICTED WATER LEVEL FOR INJECTION RATES OF 175 AND 300 GPM

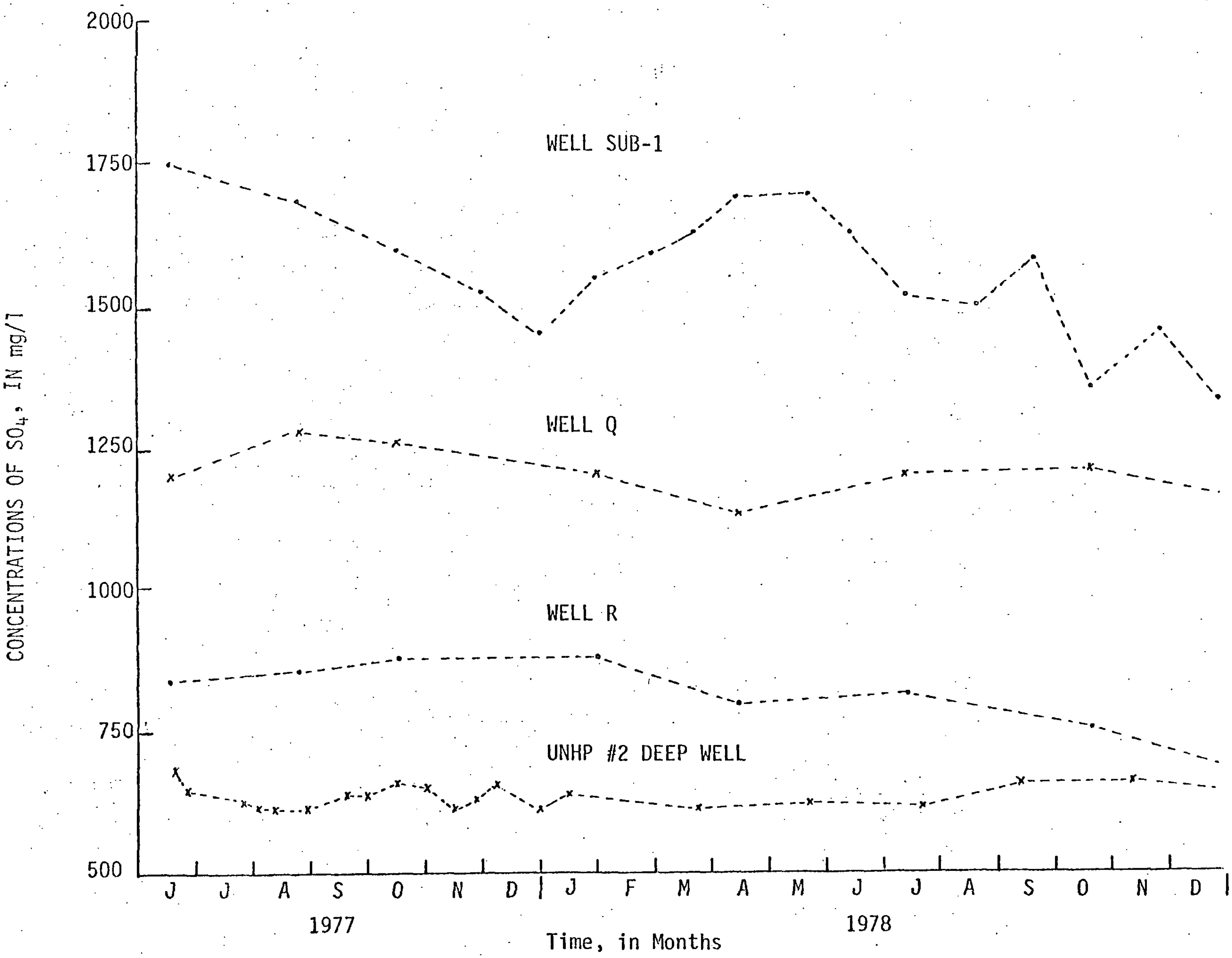


FIGURE 22. SULFATE CONCENTRATIONS FOR WELLS SUB-1, Q, R AND UNHP DEEP WELL 2 (1977 & 1978)

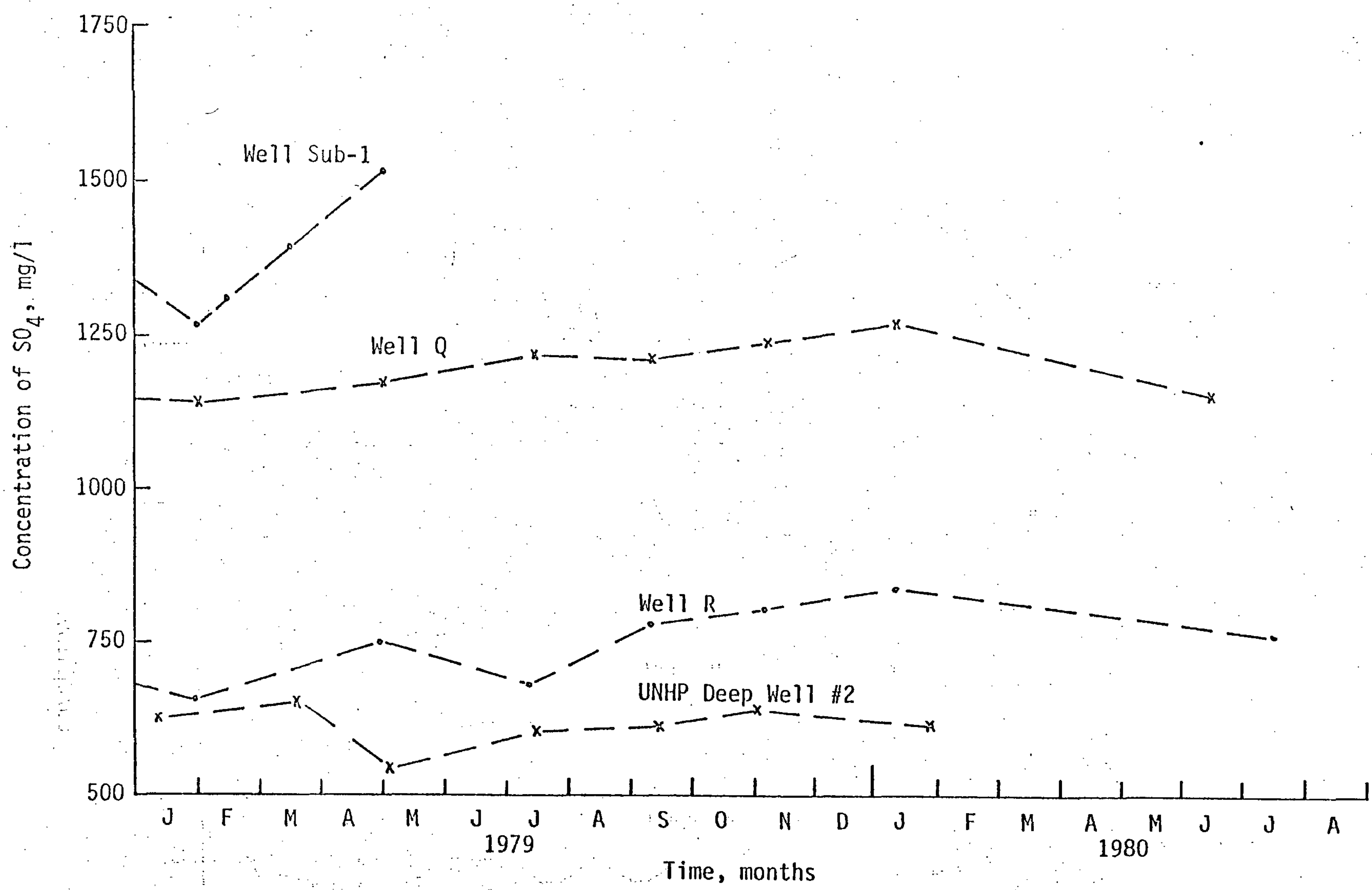


FIGURE 23. SULFATE CONCENTRATIONS FOR WELLS SUB-1, Q, R, AND UNHP DEEP WELL #2 (1979 & 1980)

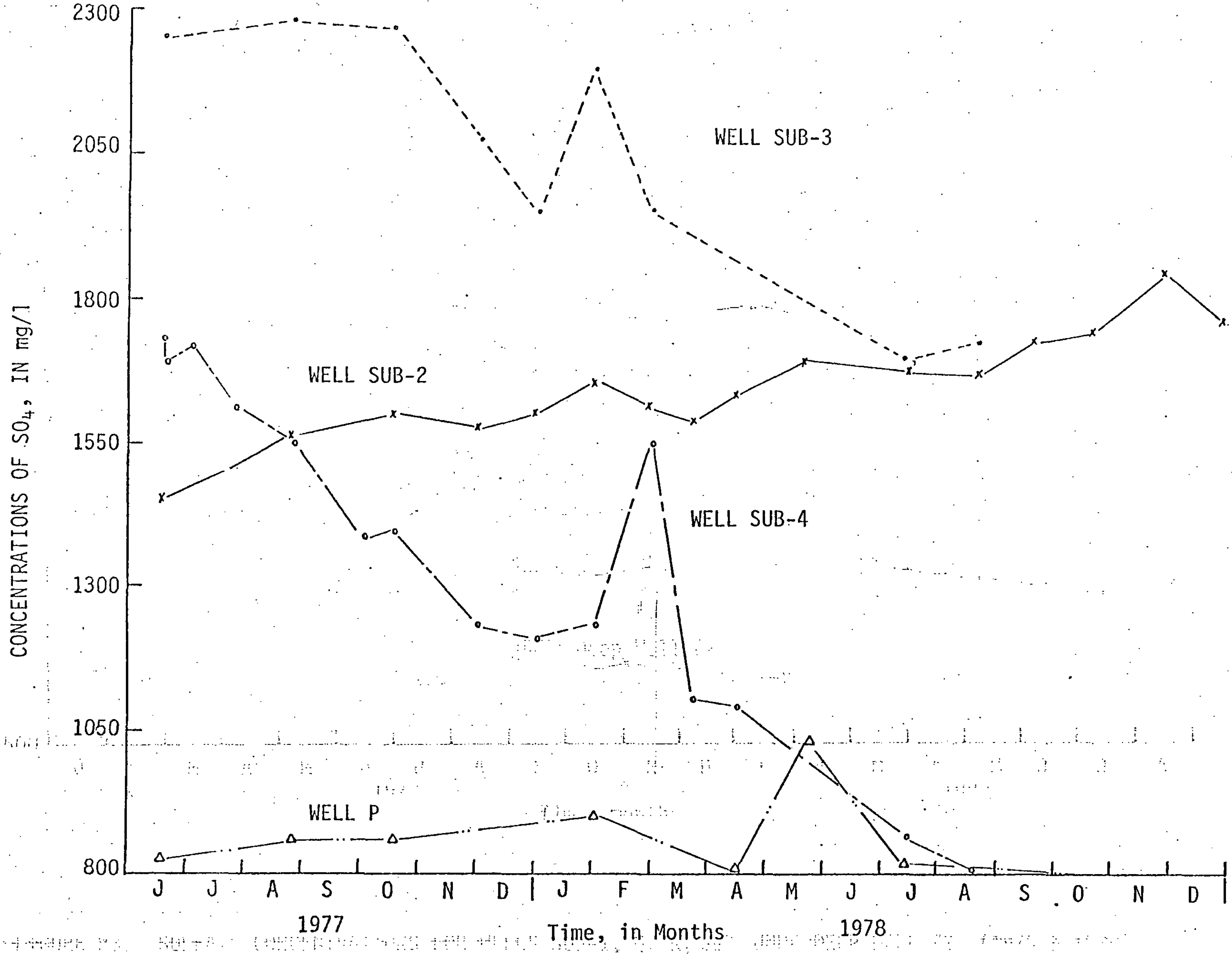


FIGURE 24. SULFATE CONCENTRATIONS FOR WELLS SUB-2, SUB-3, SUB-4 AND P (1977 & 1978)

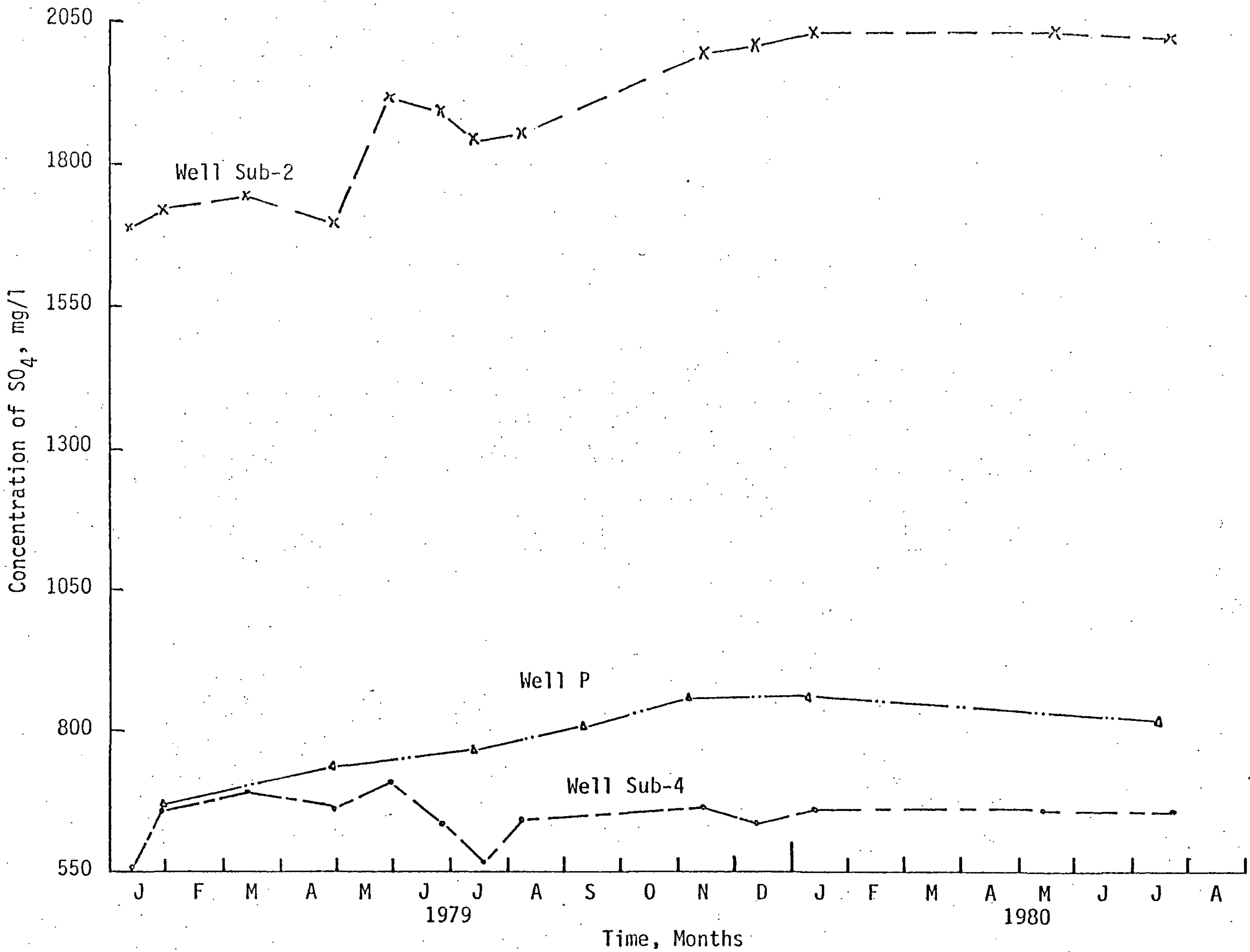


FIGURE 25. SULFATE CONCENTRATIONS FOR WELLS SUB-2, SUB-4, AND P (1979 & 1980)

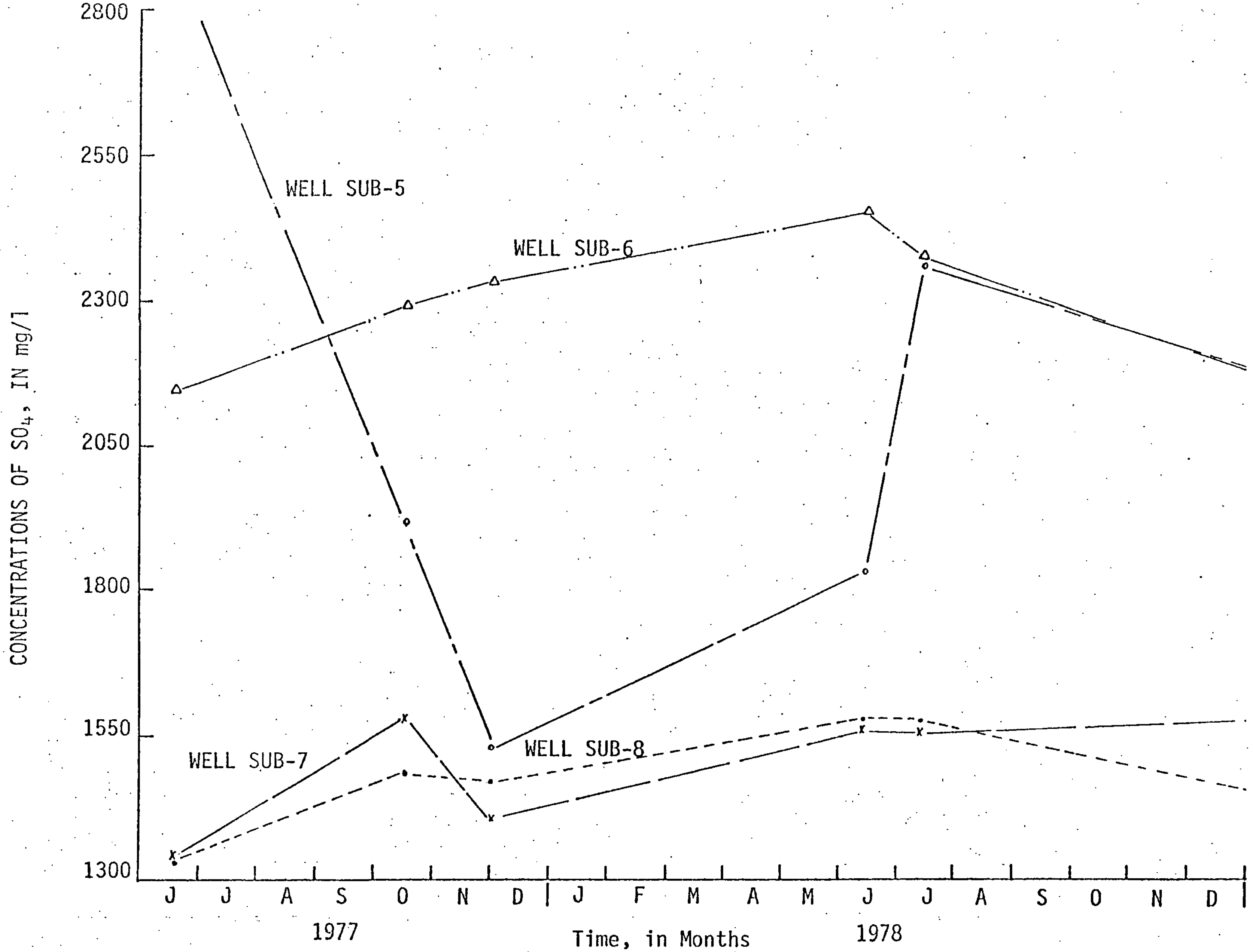


FIGURE 26. SULFATE CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7 AND SUB-8 (1977 & 1978)

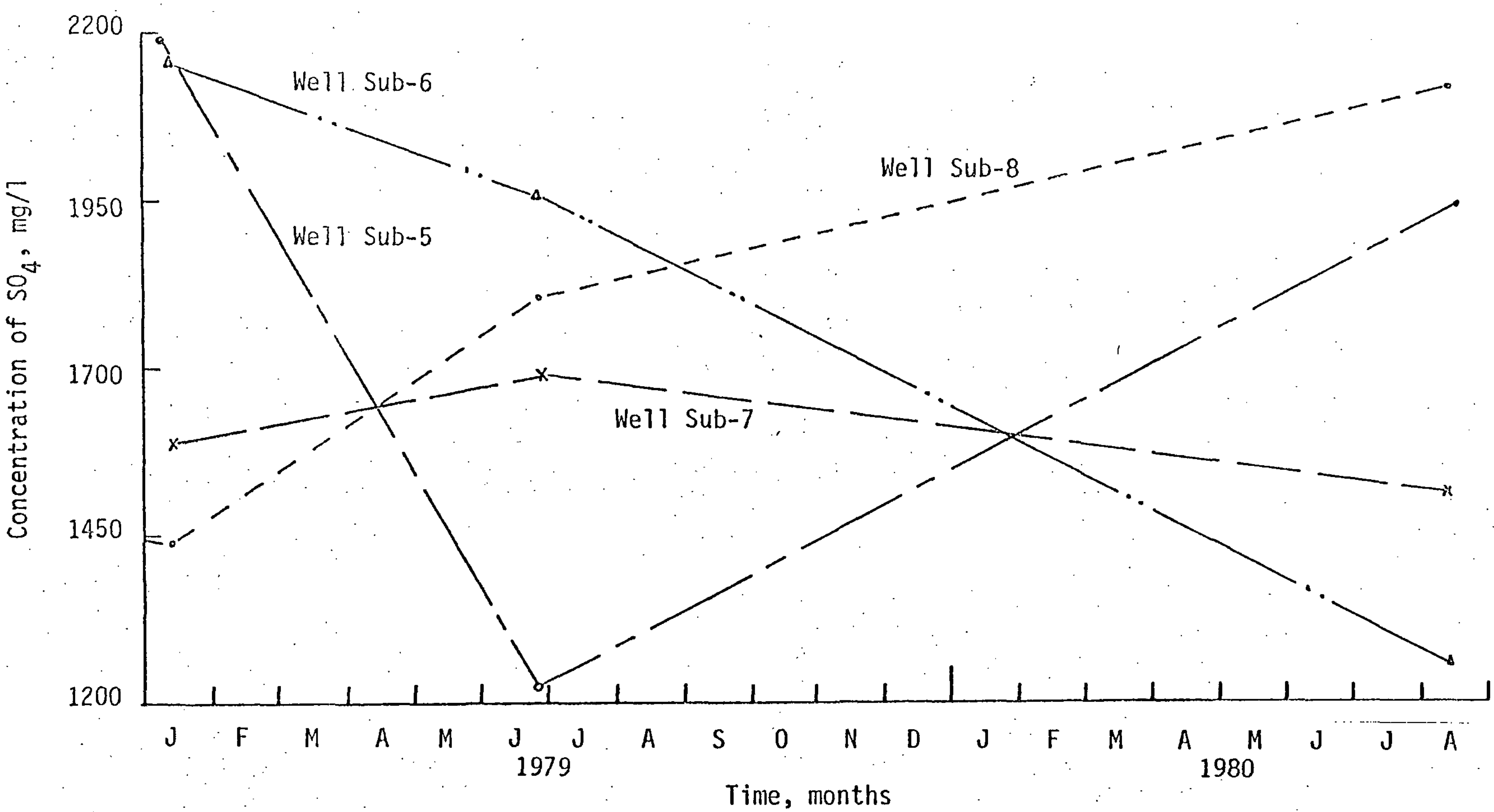


FIGURE 27. SULFATE CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7 AND SUB-8 (1979 & 1980)

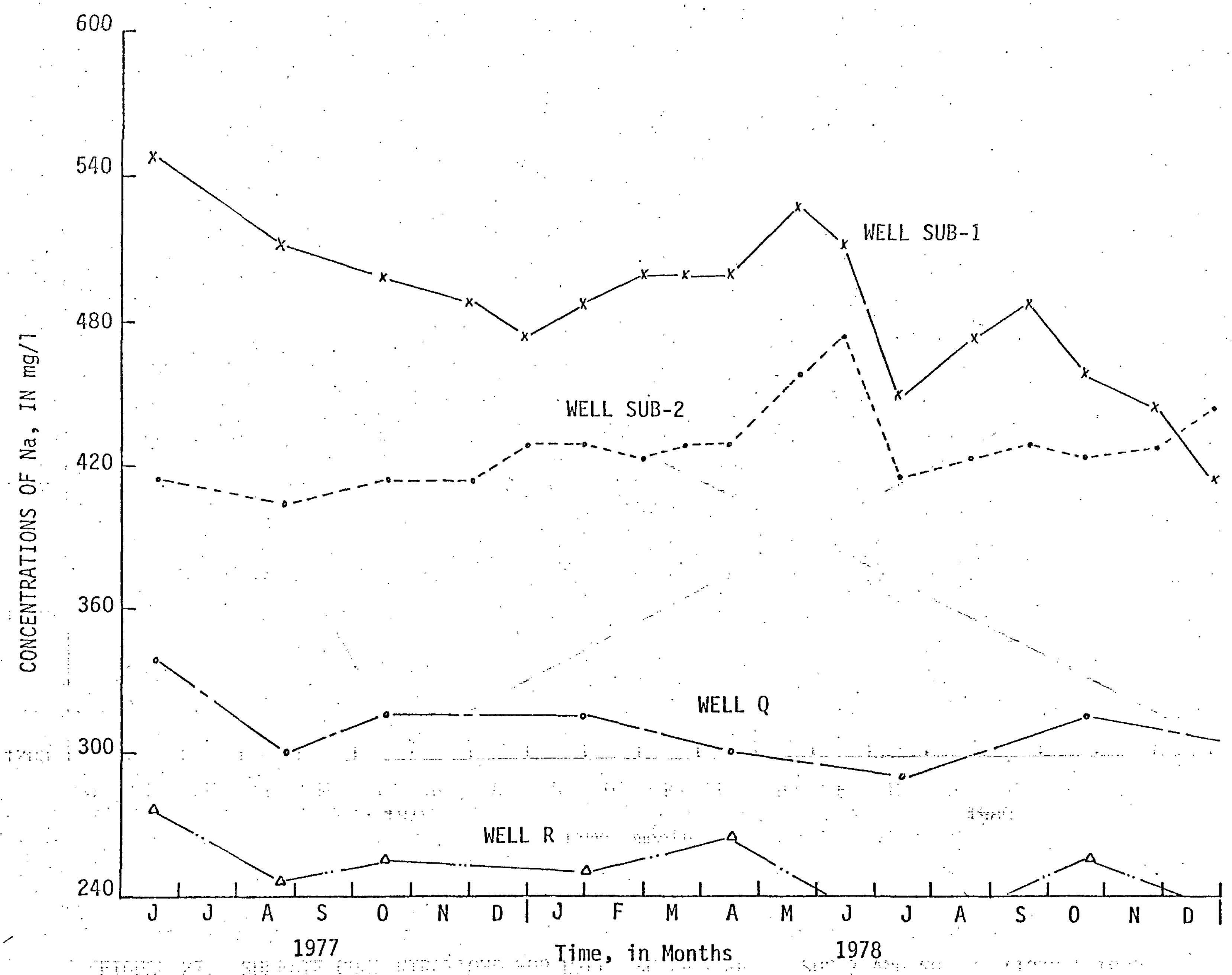


FIGURE 28. SODIUM CONCENTRATIONS FOR WELLS SUB-1, SUB-2, Q AND R (1977 & 1978)

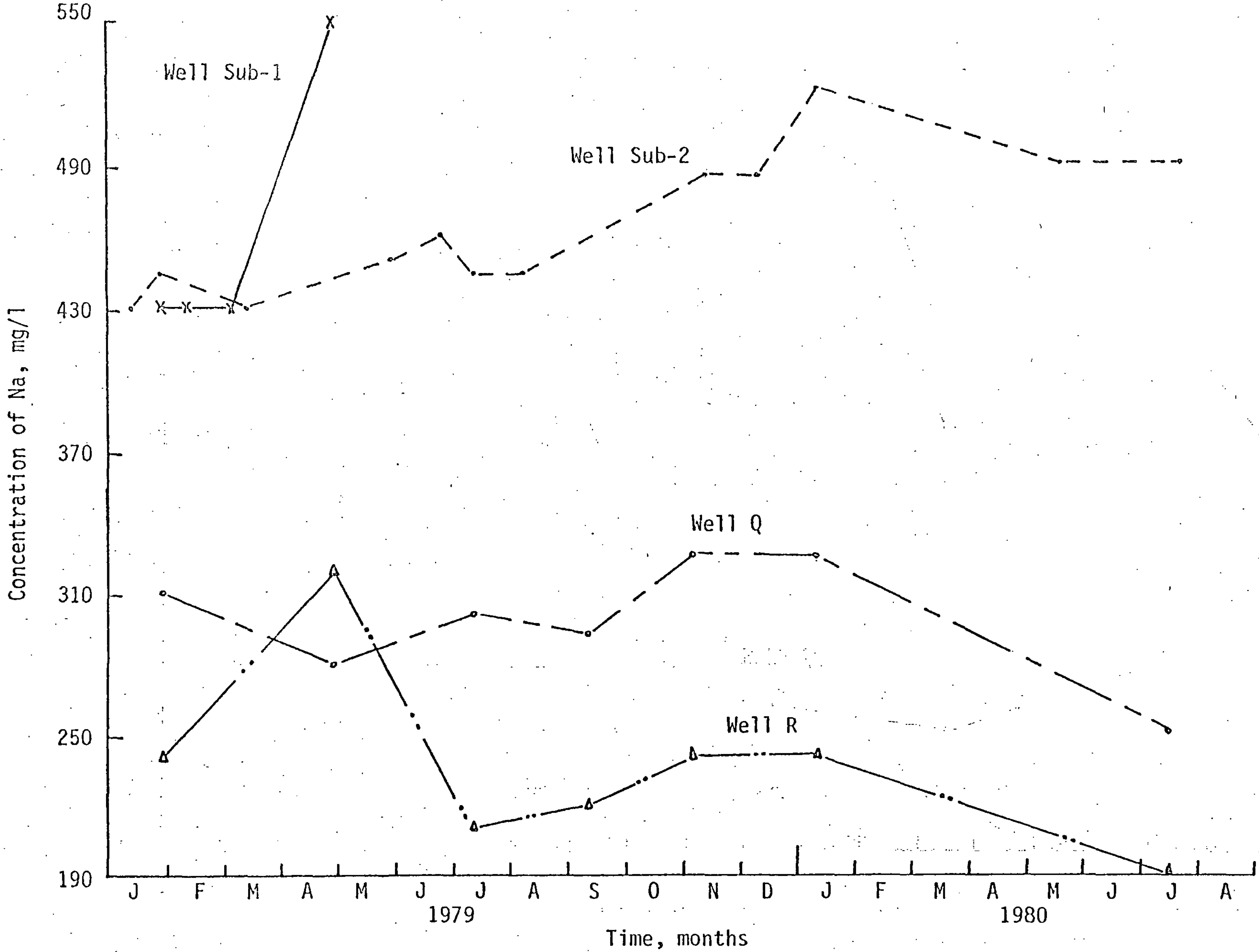


FIGURE 29. SODIUM CONCENTRATIONS FOR WELLS SUB-1, SUB-2, Q AND R (1979 & 1980)

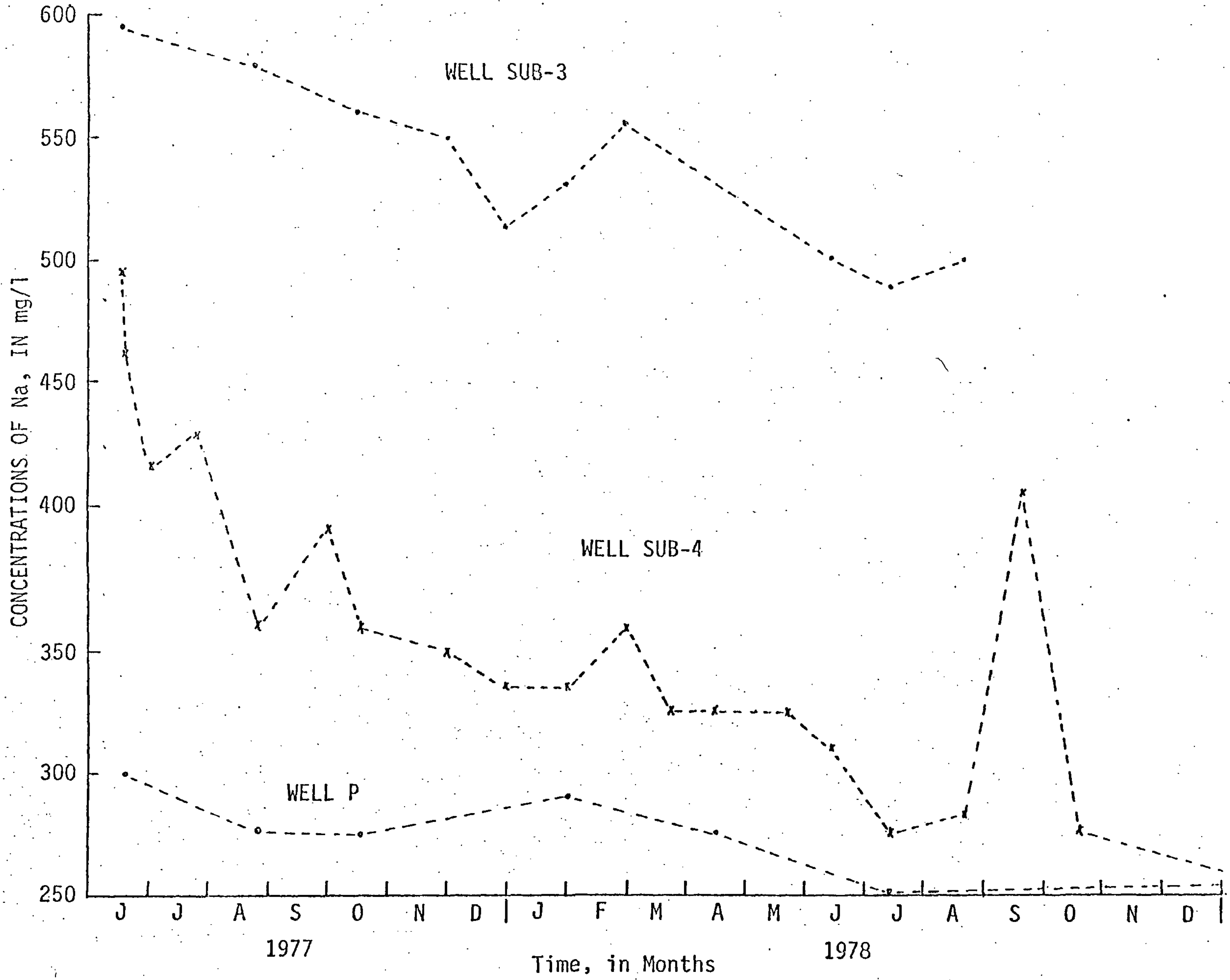


FIGURE 30. SODIUM CONCENTRATIONS FOR WELLS SUB-3, SUB-4 AND P (1977 & 1978)

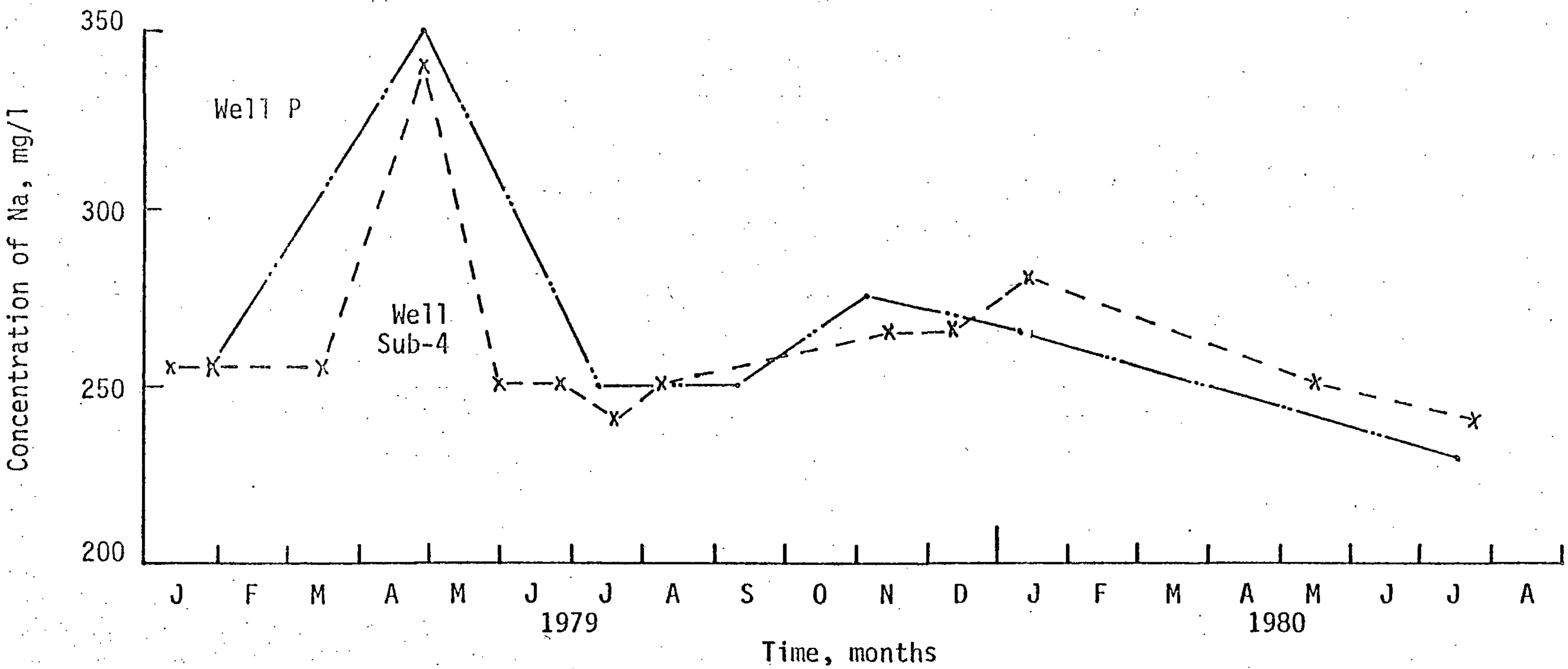


FIGURE 31. SODIUM CONCENTRATIONS FOR WELLS SUB-4 AND P (1979 & 1980)

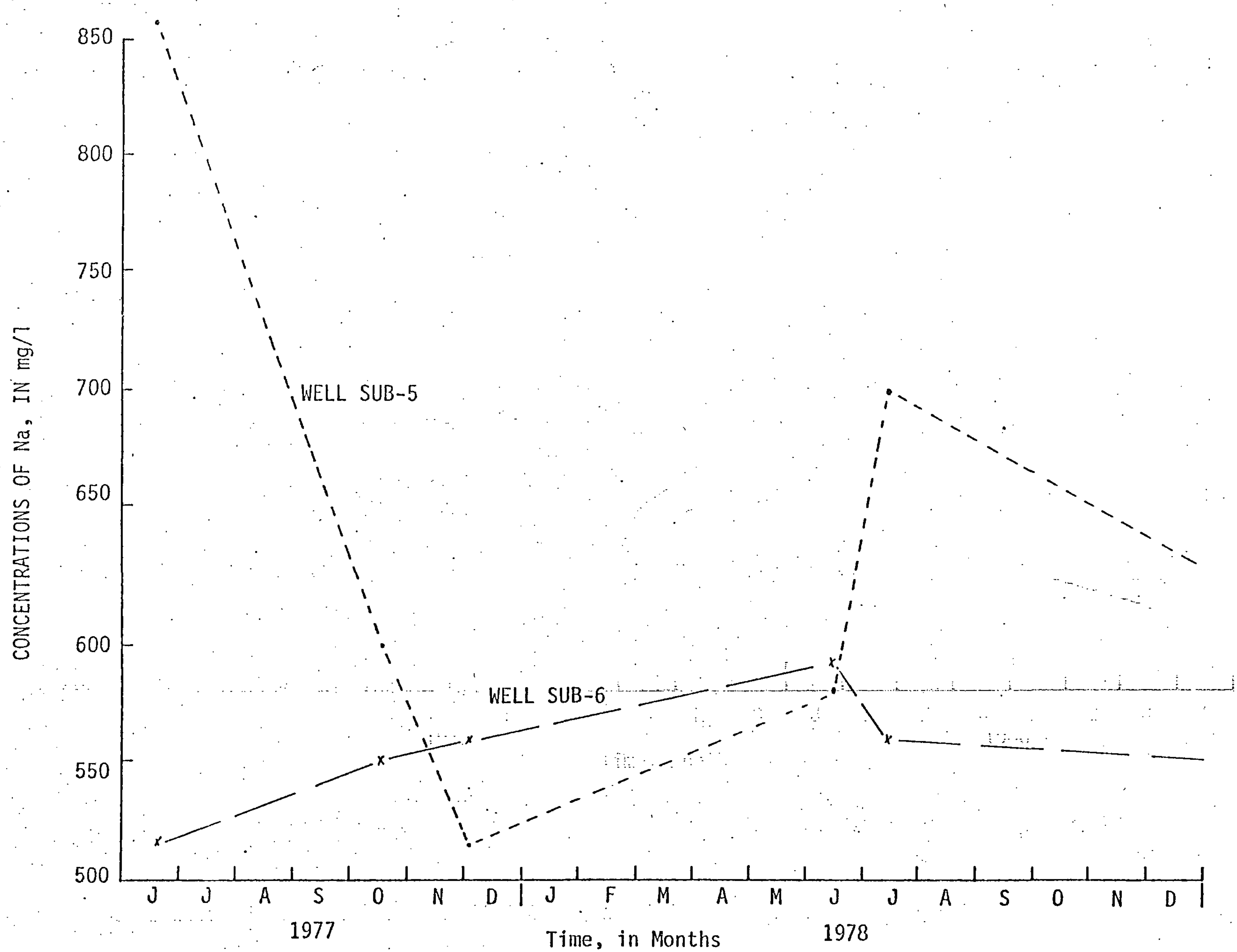


FIGURE 32. SODIUM CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1977 & 1978)

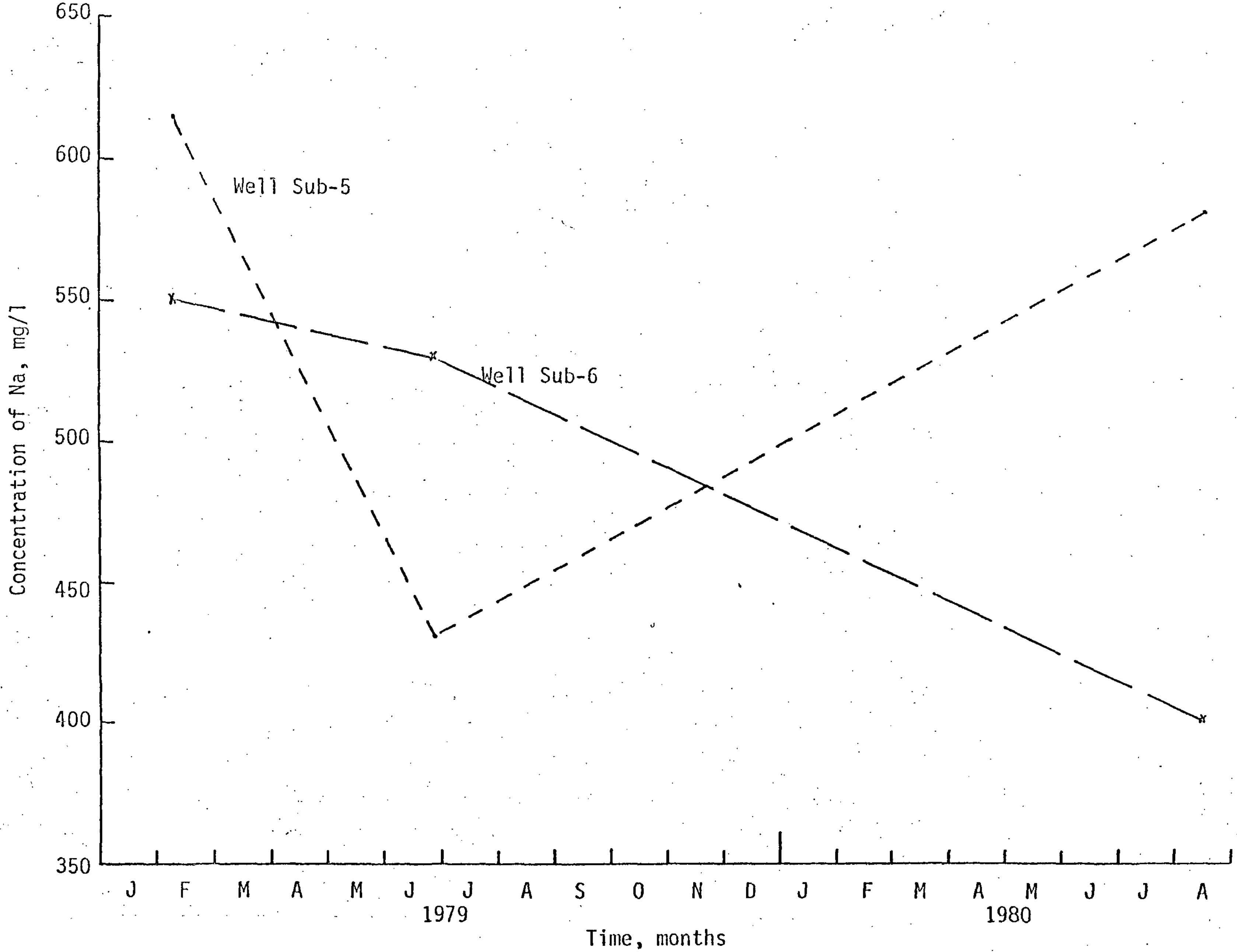


FIGURE 33. SODIUM CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1979 & 1980)

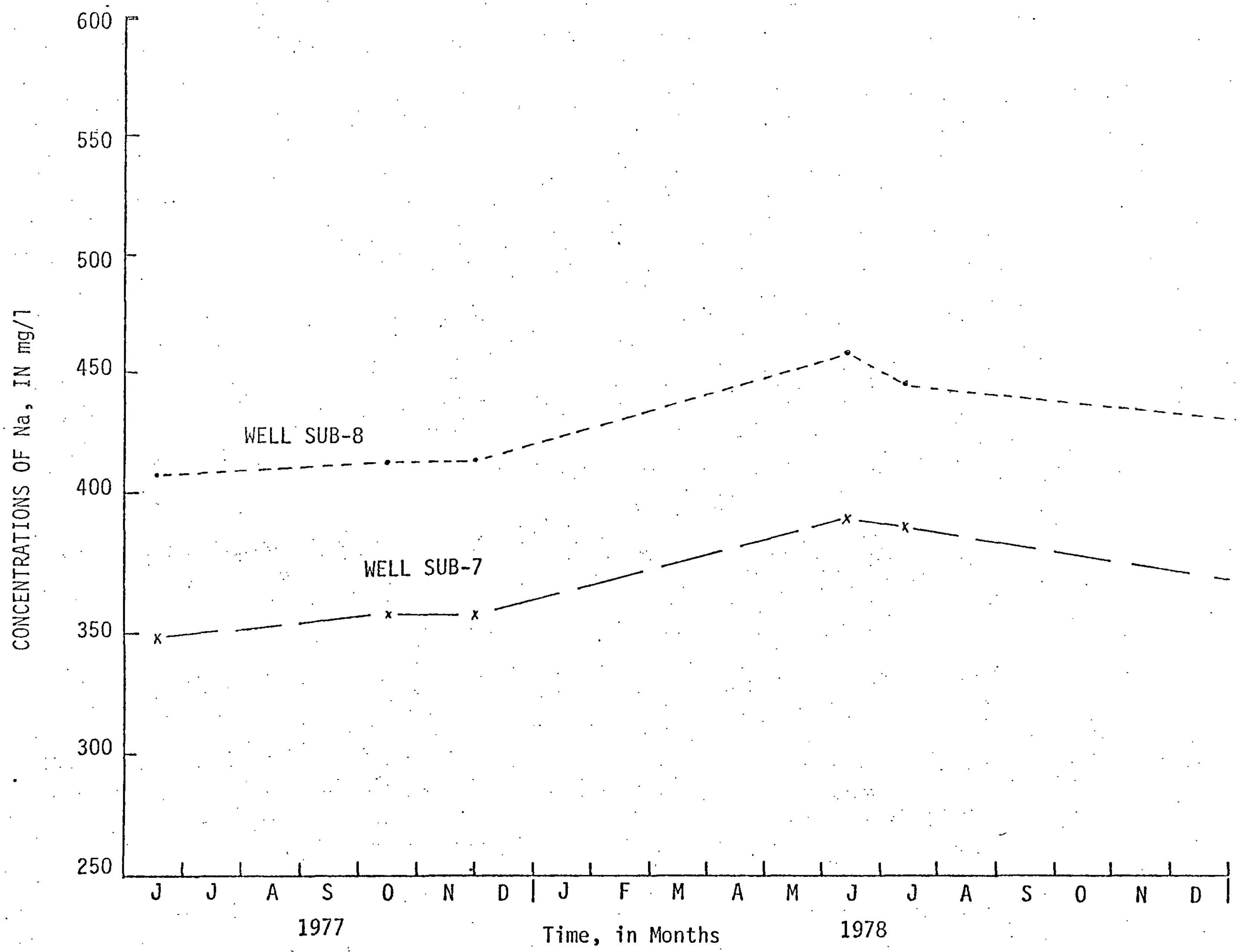


FIGURE 34. SODIUM CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8 (1977 & 1978)

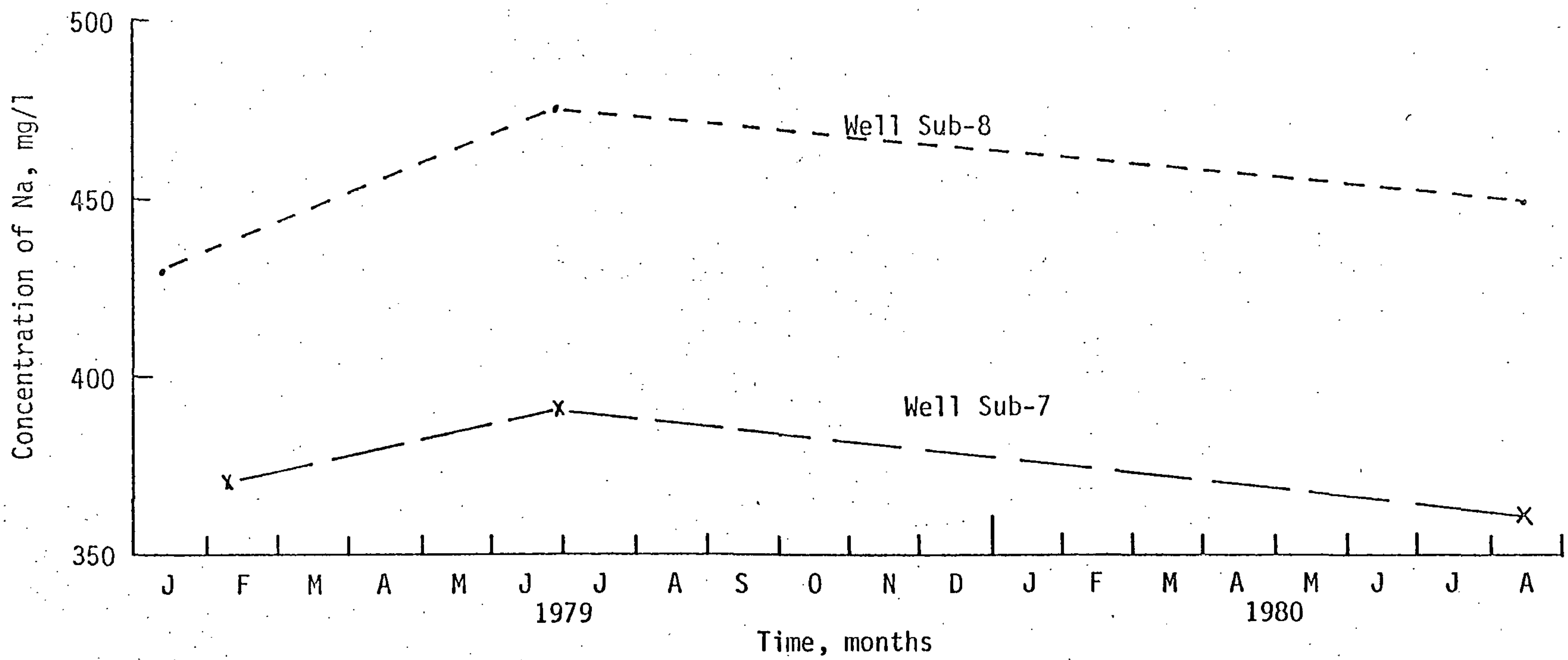


FIGURE 35. SODIUM CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8 (1979 & 1980)

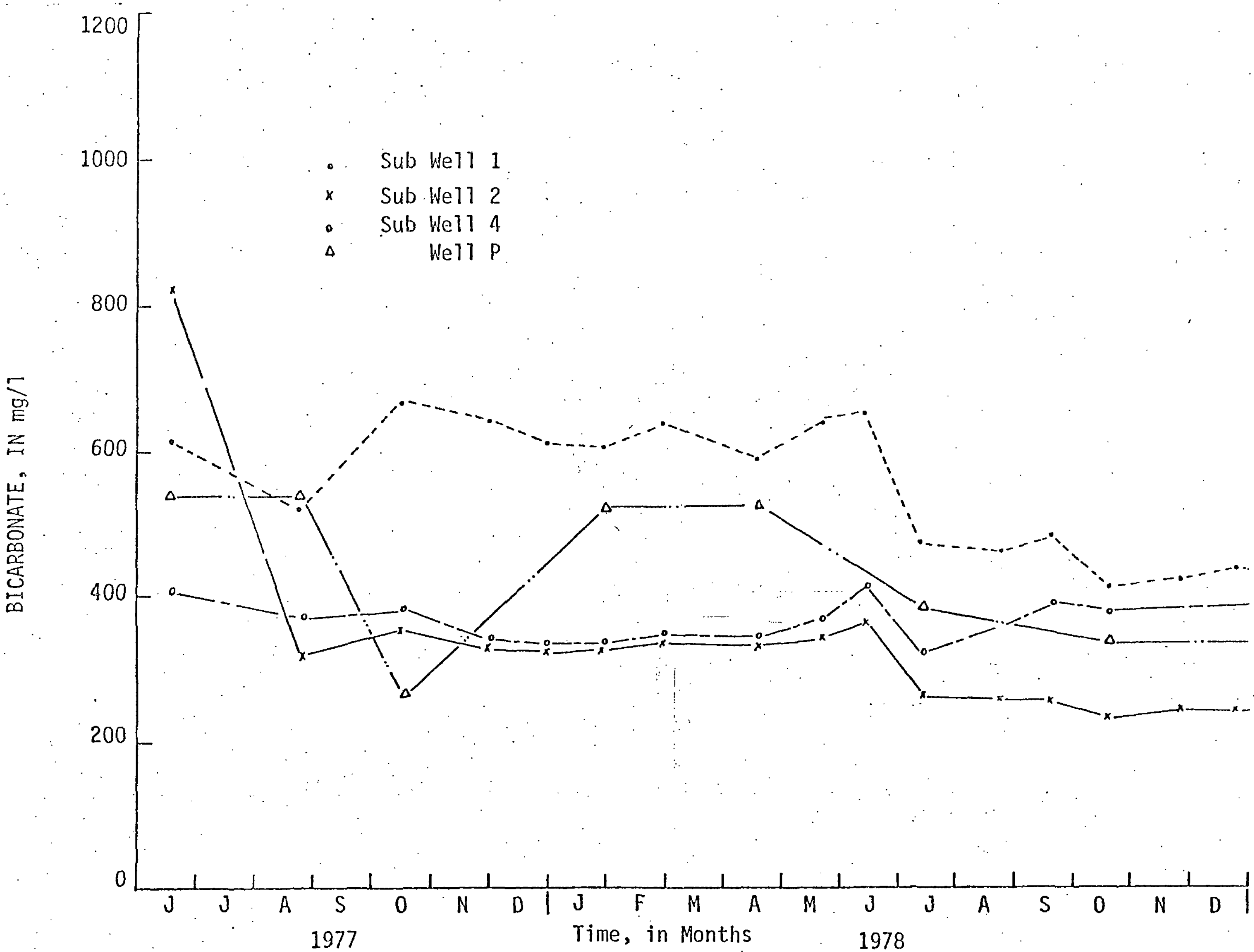


FIGURE 36. BICARBONATE CONCENTRATIONS FOR WELLS SUB-1, SUB-2, SUB-4 AND P (1977 & 1978)

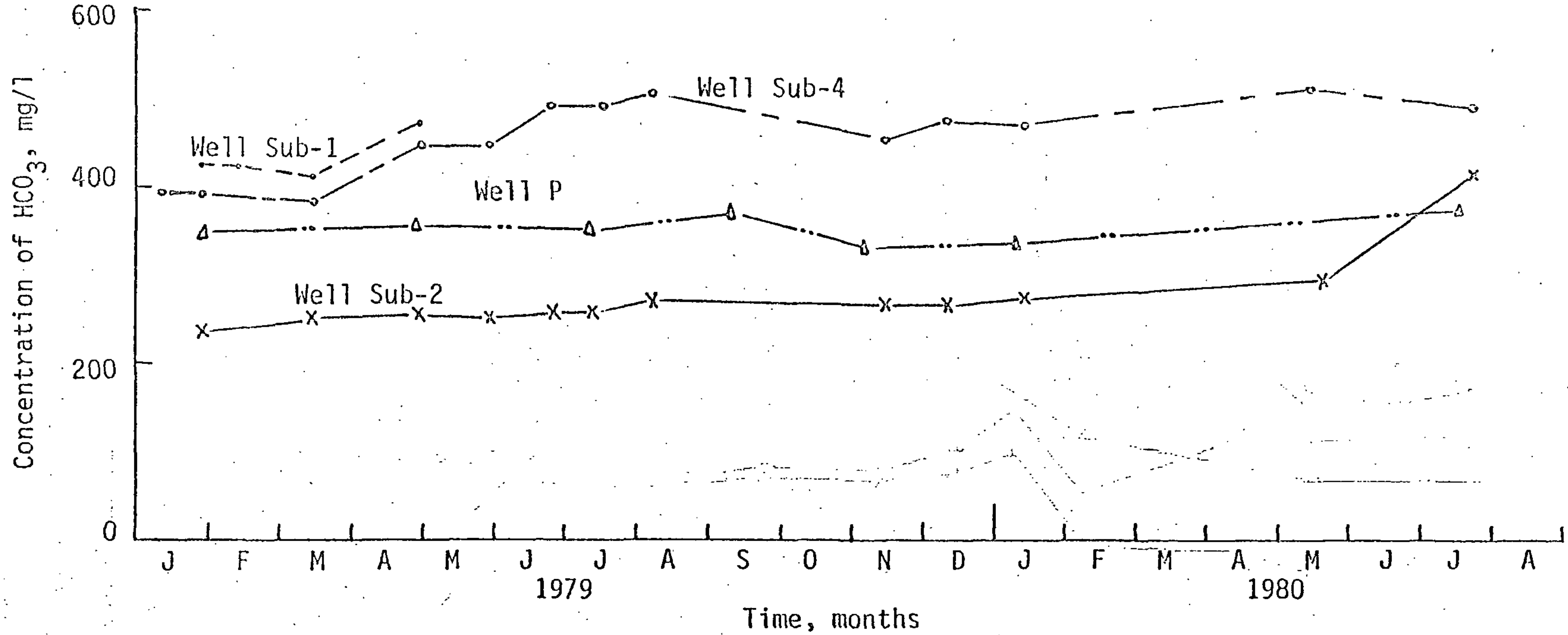


FIGURE 37. BICARBONATE CONCENTRATIONS FOR WELLS SUB-1,SUB-2, SUB-4 AND P (1979 & 1980)

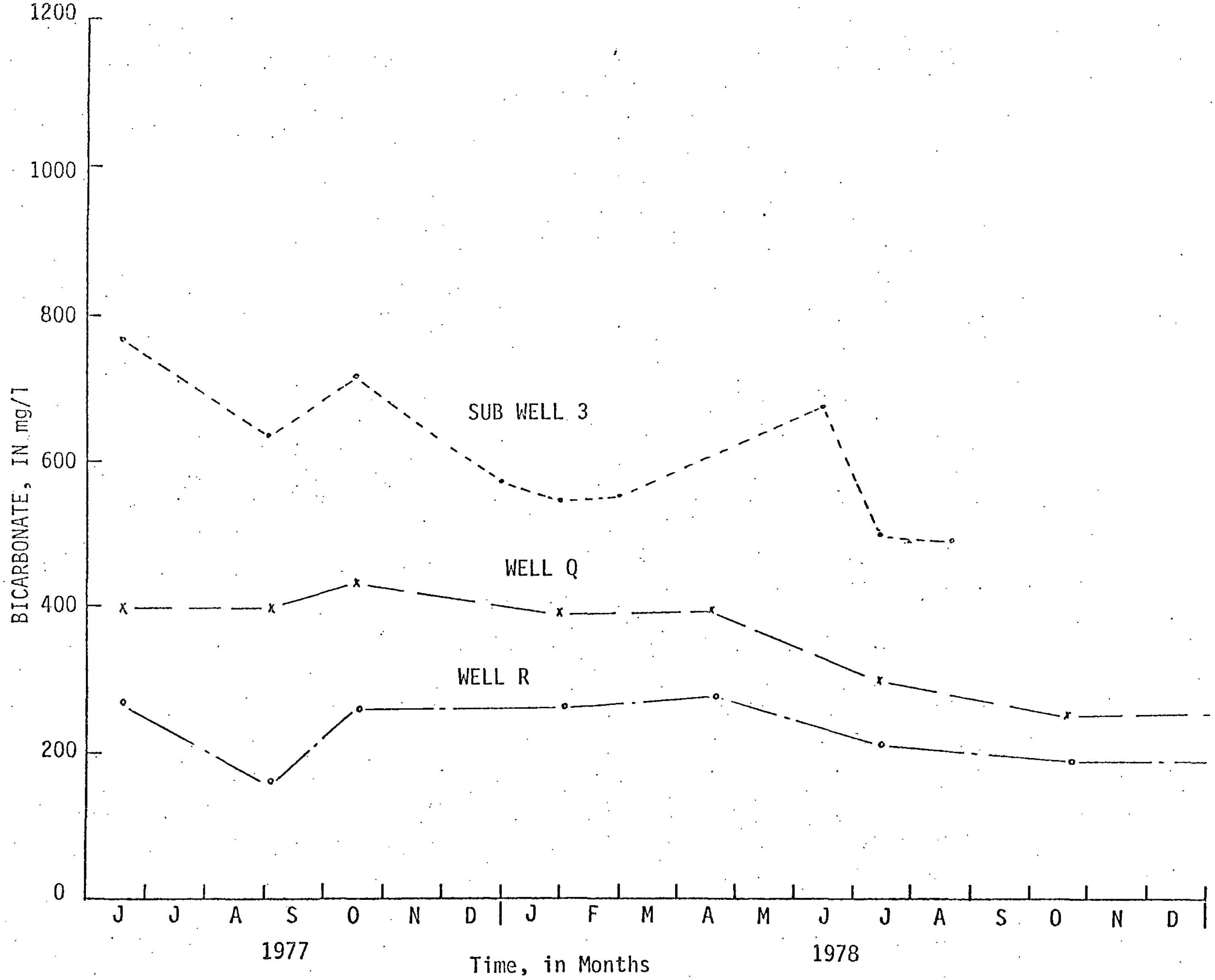


FIGURE 38. BICARBONATE CONCENTRATIONS FOR WELLS R, Q AND SUB-3 (1977 & 1978)

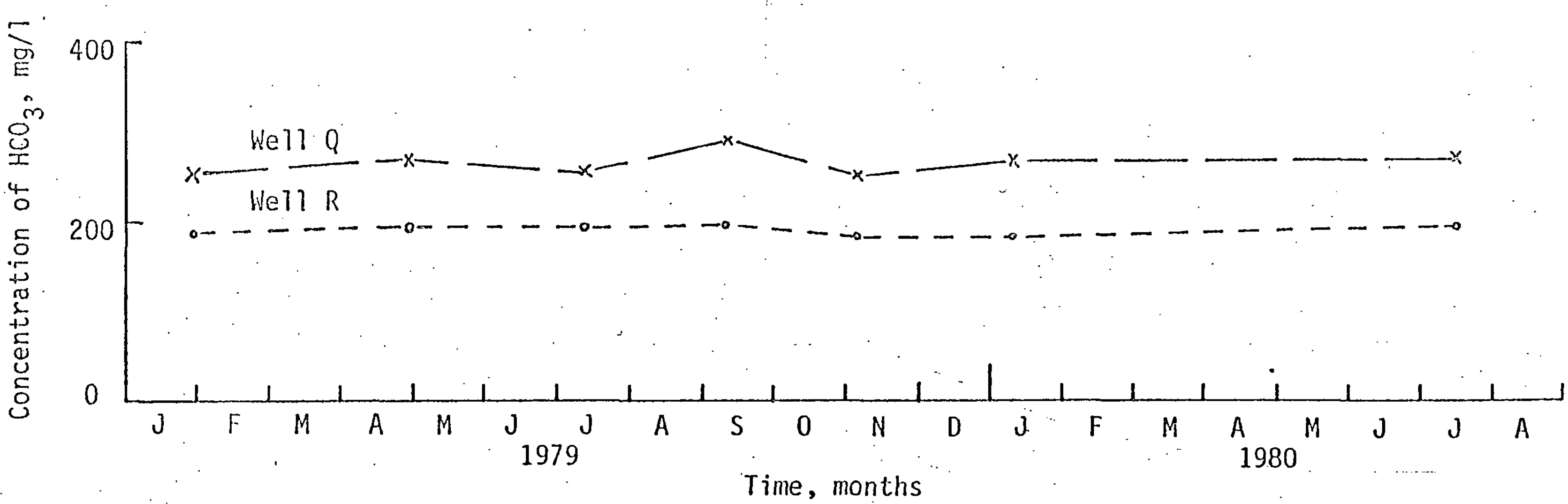


FIGURE 39. BICARBONATE CONCENTRATIONS FOR WELLS Q AND R (1979 & 1980)

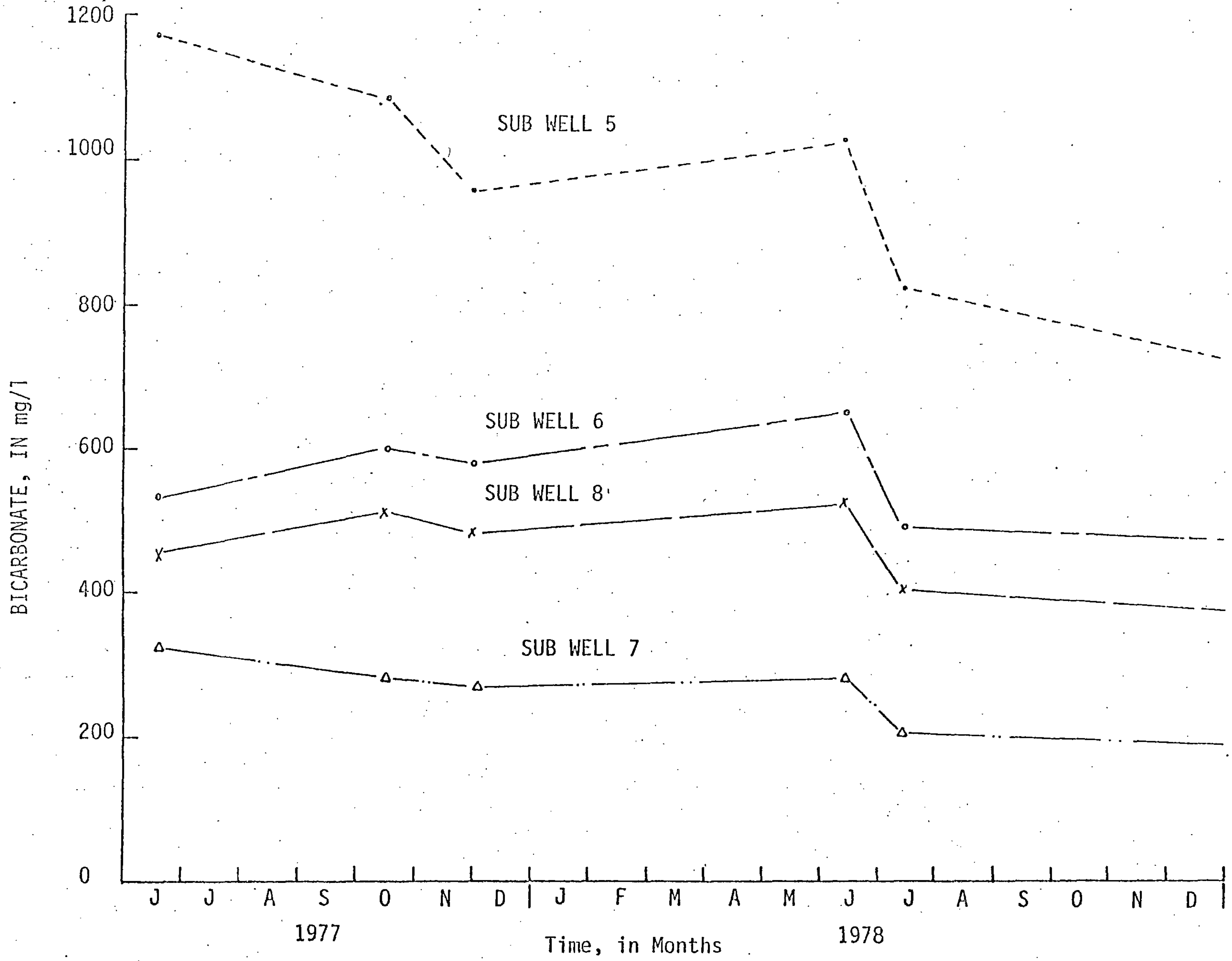


FIGURE 40. BICARBONATE CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7, AND SUB-8 (1977 & 1978)

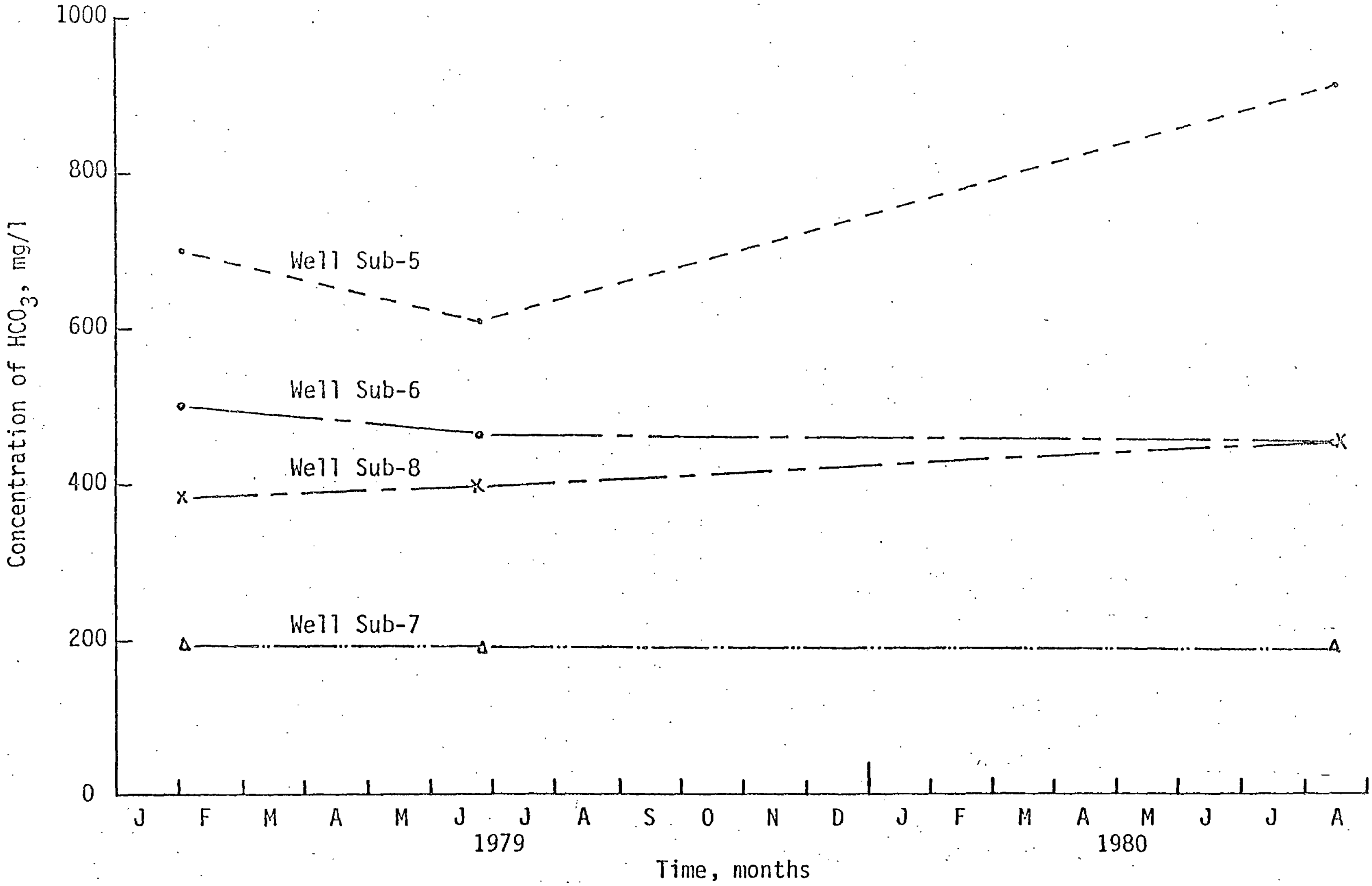


FIGURE 41. BICARBONATE CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7, AND SUB-8 (1979 & 1980)

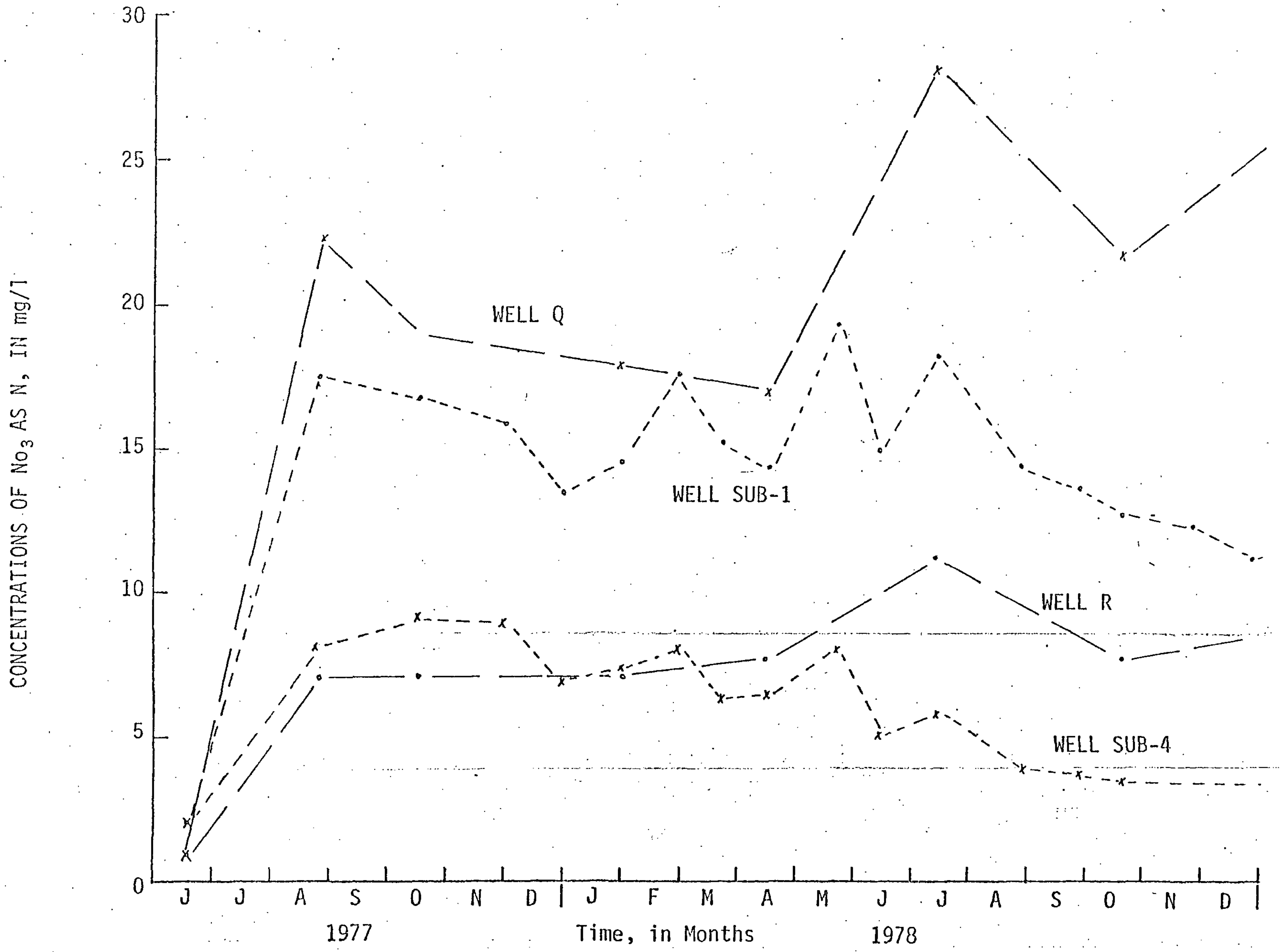


FIGURE 42. NITRATE CONCENTRATIONS AS N FOR WELLS SUB-1, SUB-4, Q AND R (1977 & 1978)

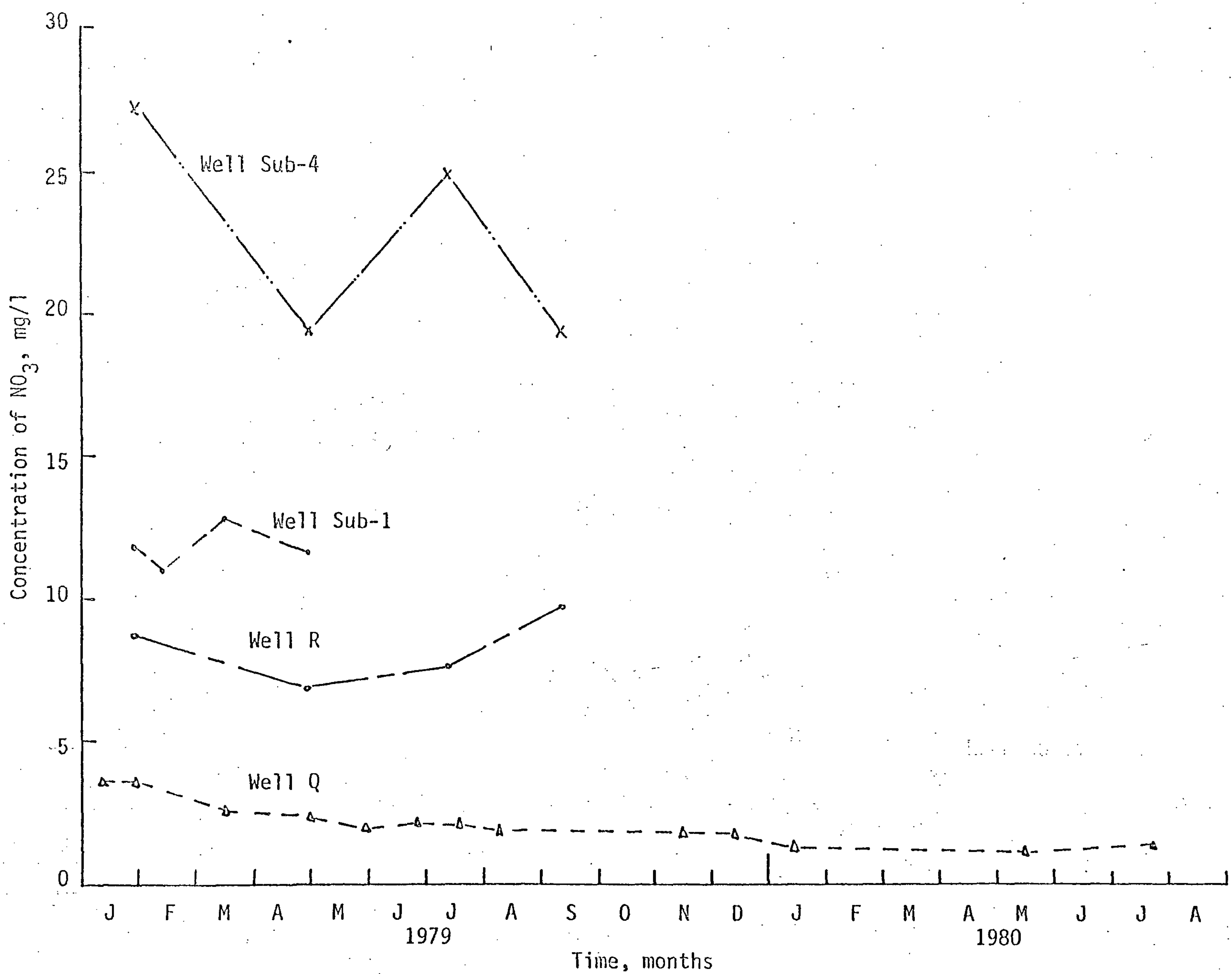


FIGURE 43. NITRATE CONCENTRATIONS AS N, FOR WELLS SUB-1, SUB-4, Q, AND R (1979 & 1980)

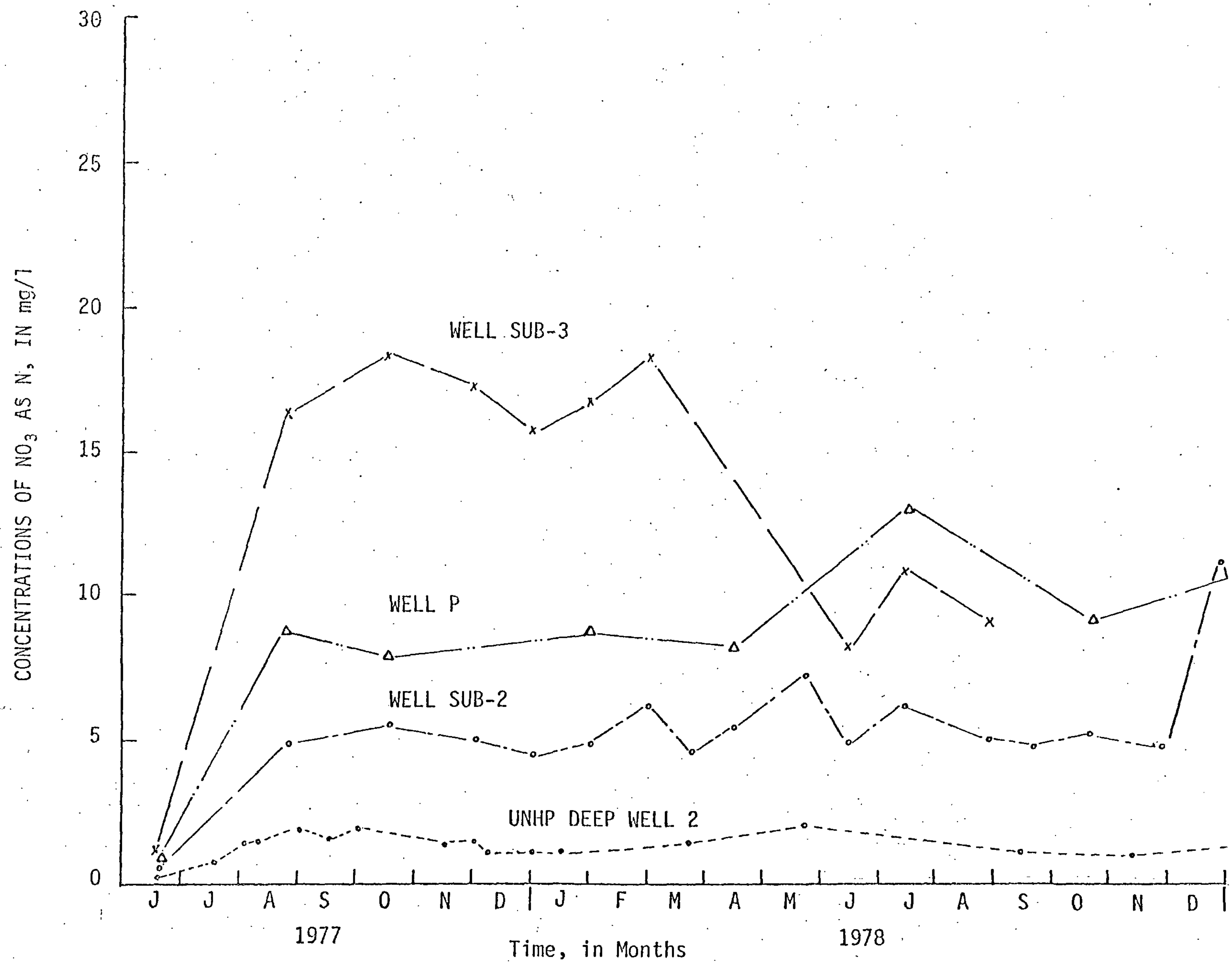


FIGURE 44. NITRATE CONCENTRATIONS AS N FOR WELLS SUB-2, SUB-3, P AND UNHP DEEP WELL 2 (1977 & 1978)

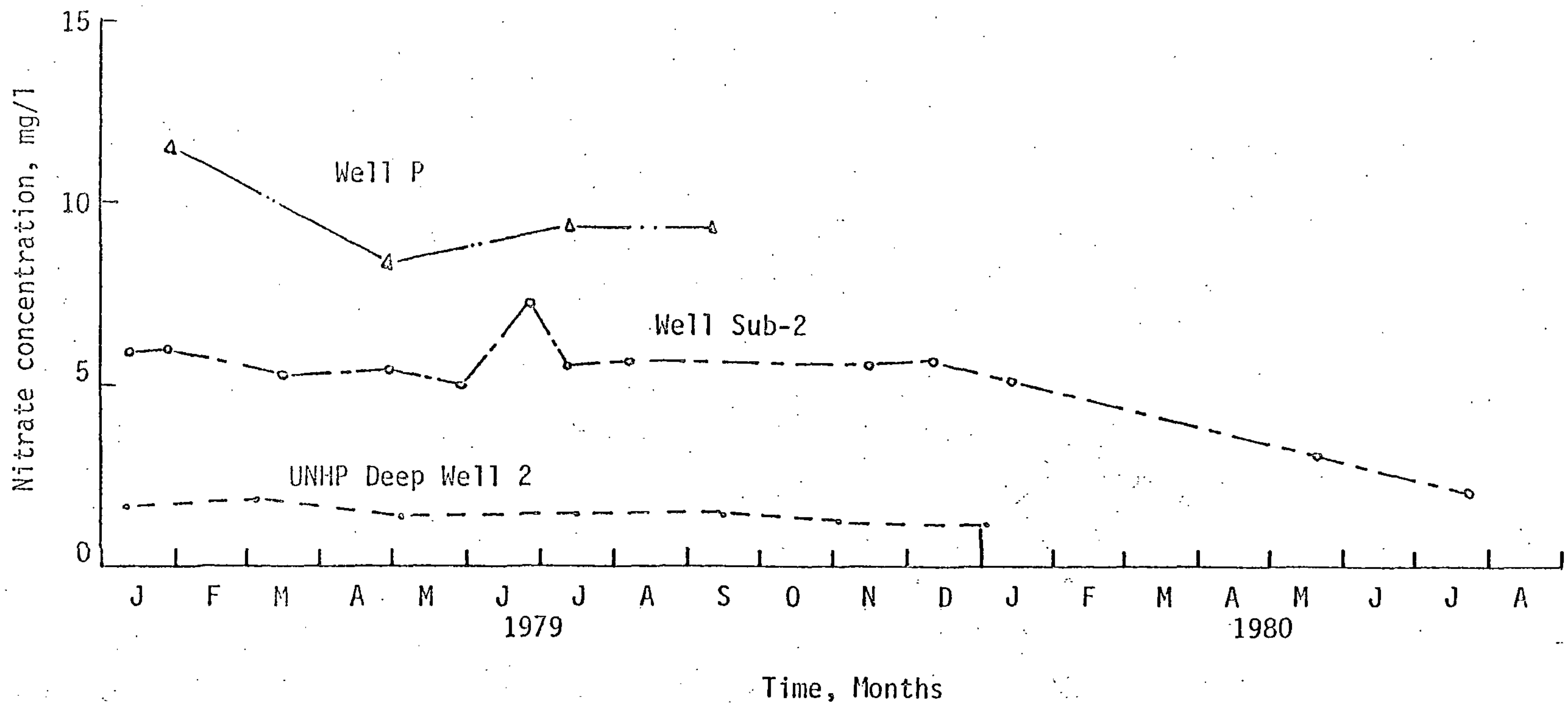


FIGURE 45. NITRATE CONCENTRATIONS AS N FOR WELLS SUB-2, P and UNHP Deep Well 2 (1979 & 1980)

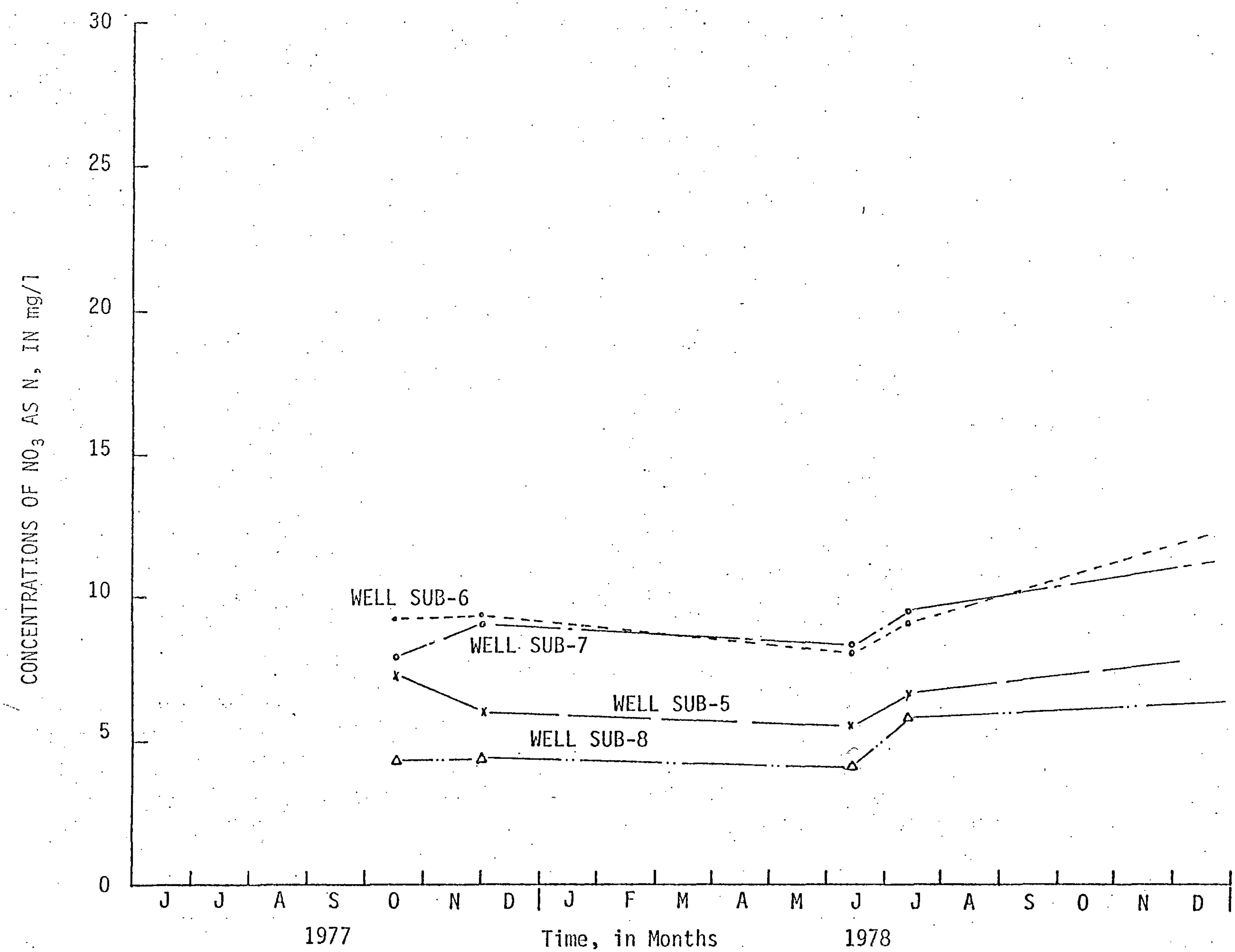


FIGURE 46. NITRATE CONCENTRATIONS AS N FOR WELLS SUB-5, SUB-6, SUB-7 and SUB-8 (1977 & 1978)

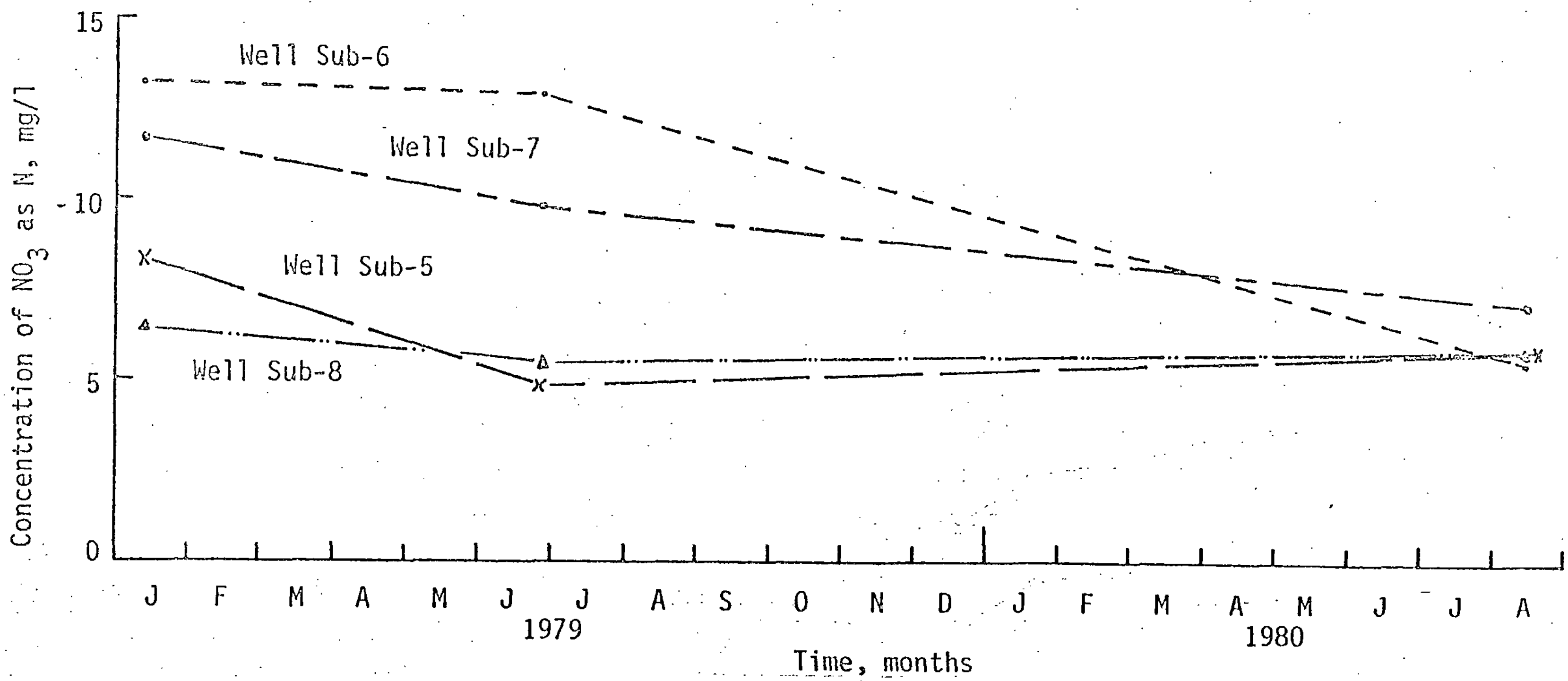


FIGURE 47. NITRATE CONCENTRATIONS AS N FOR WELLS SUB-5, SUB-6, SUB-7, and SUB-8 (1979-1980)

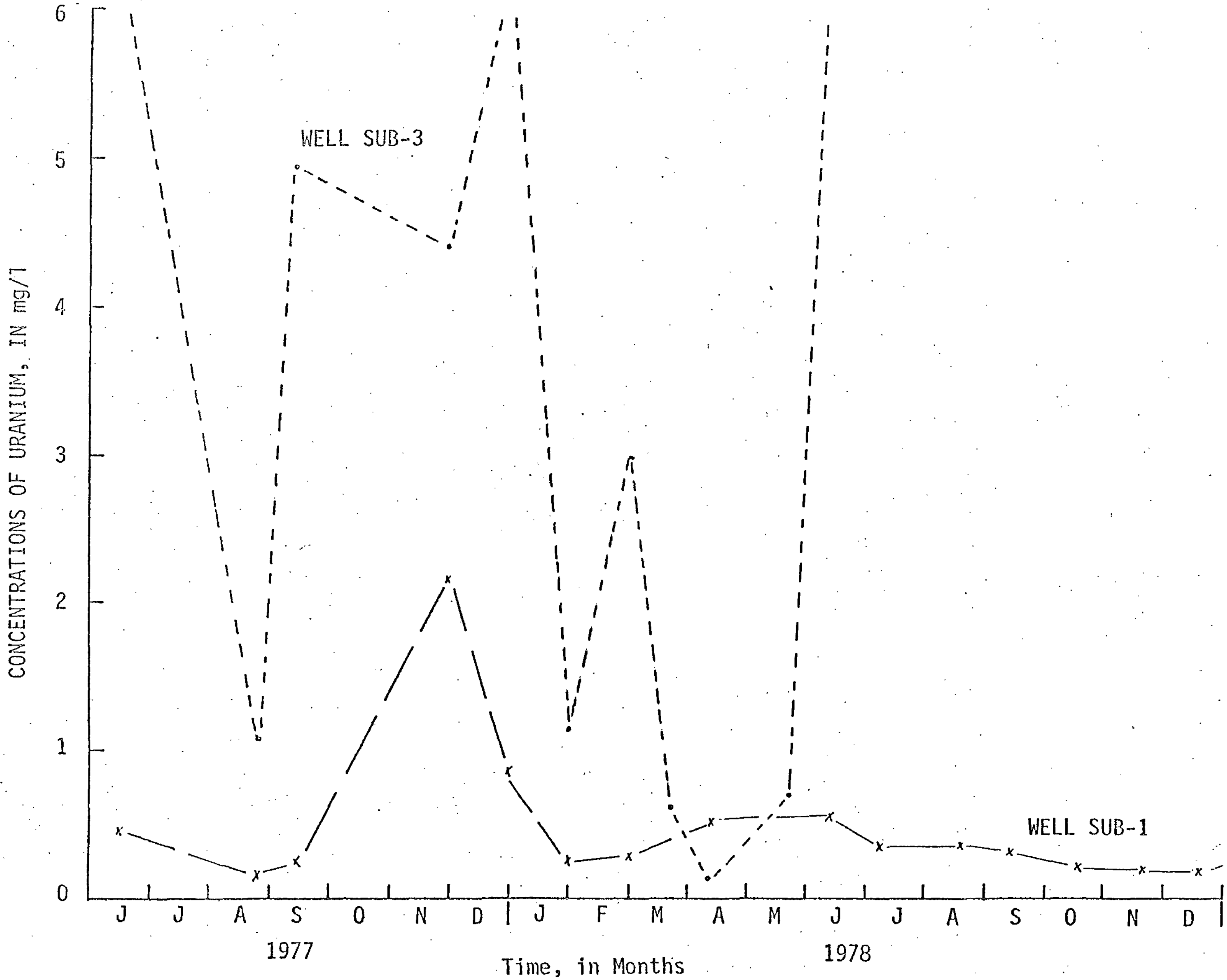


FIGURE 48. URANIUM CONCENTRATIONS FOR WELLS SUB-1 AND SUB-3 (1977 & 1978)

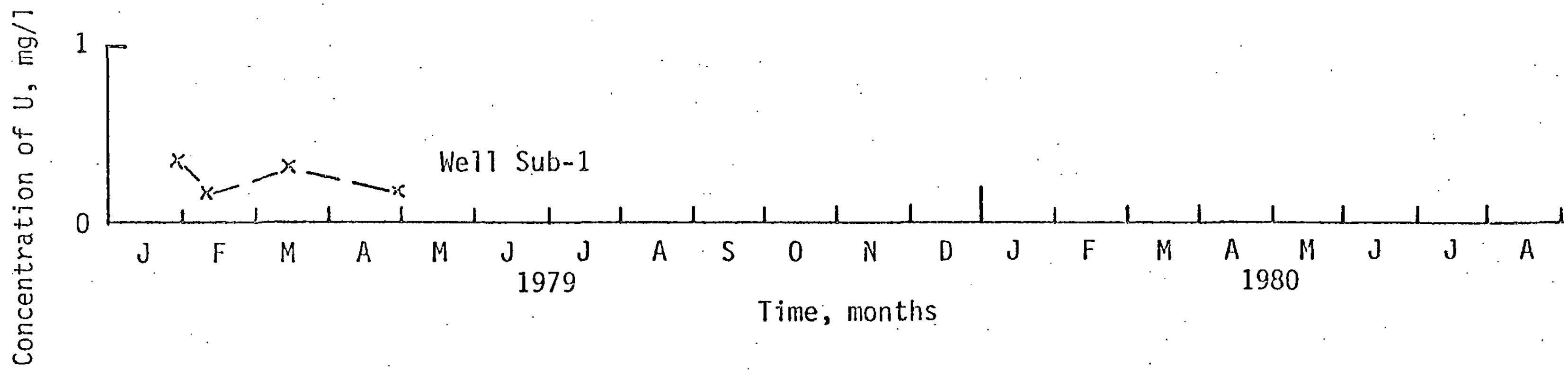


FIGURE 49. URANIUM CONCENTRATIONS FOR WELL SUB-1 (1979 & 1980)

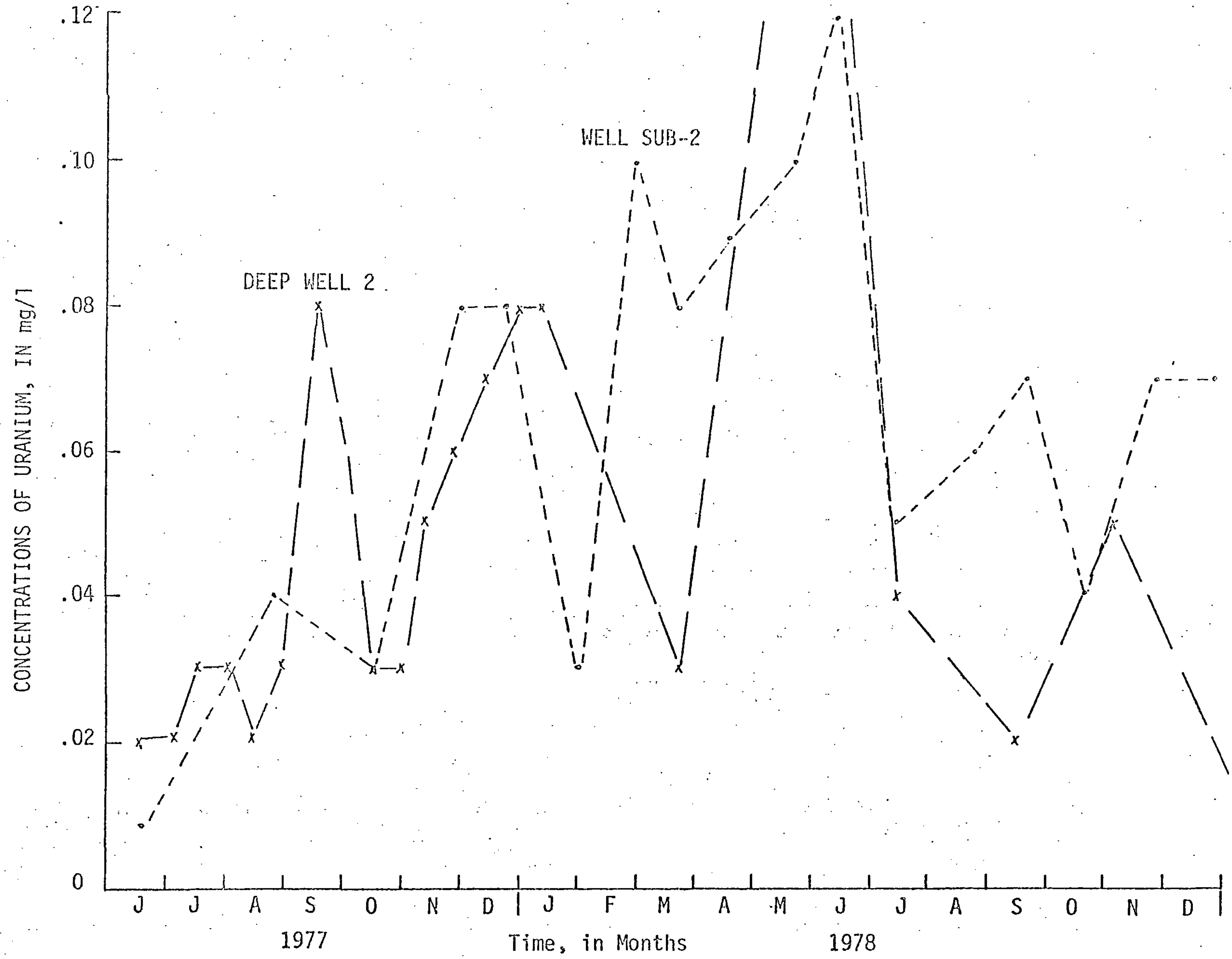


FIGURE 50. URANIUM CONCENTRATIONS FOR WELLS SUB-2 AND UNHP DEEP WELL 2 (1977 & 1978)

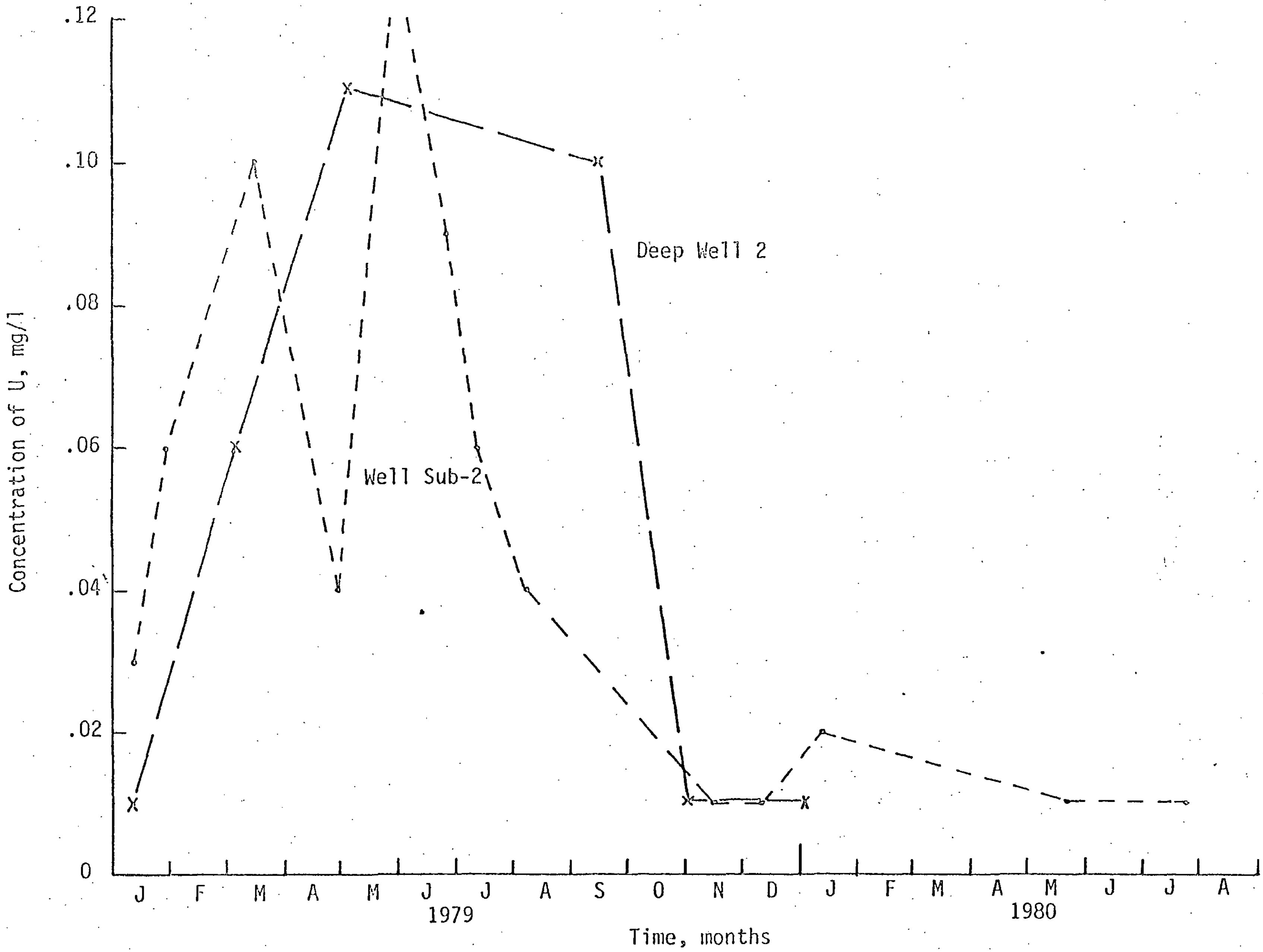


FIGURE 51. URANIUM CONCENTRATIONS FOR WELLS SUB-2 and UNHP DEEP WELL 2 (1979 & 1980)

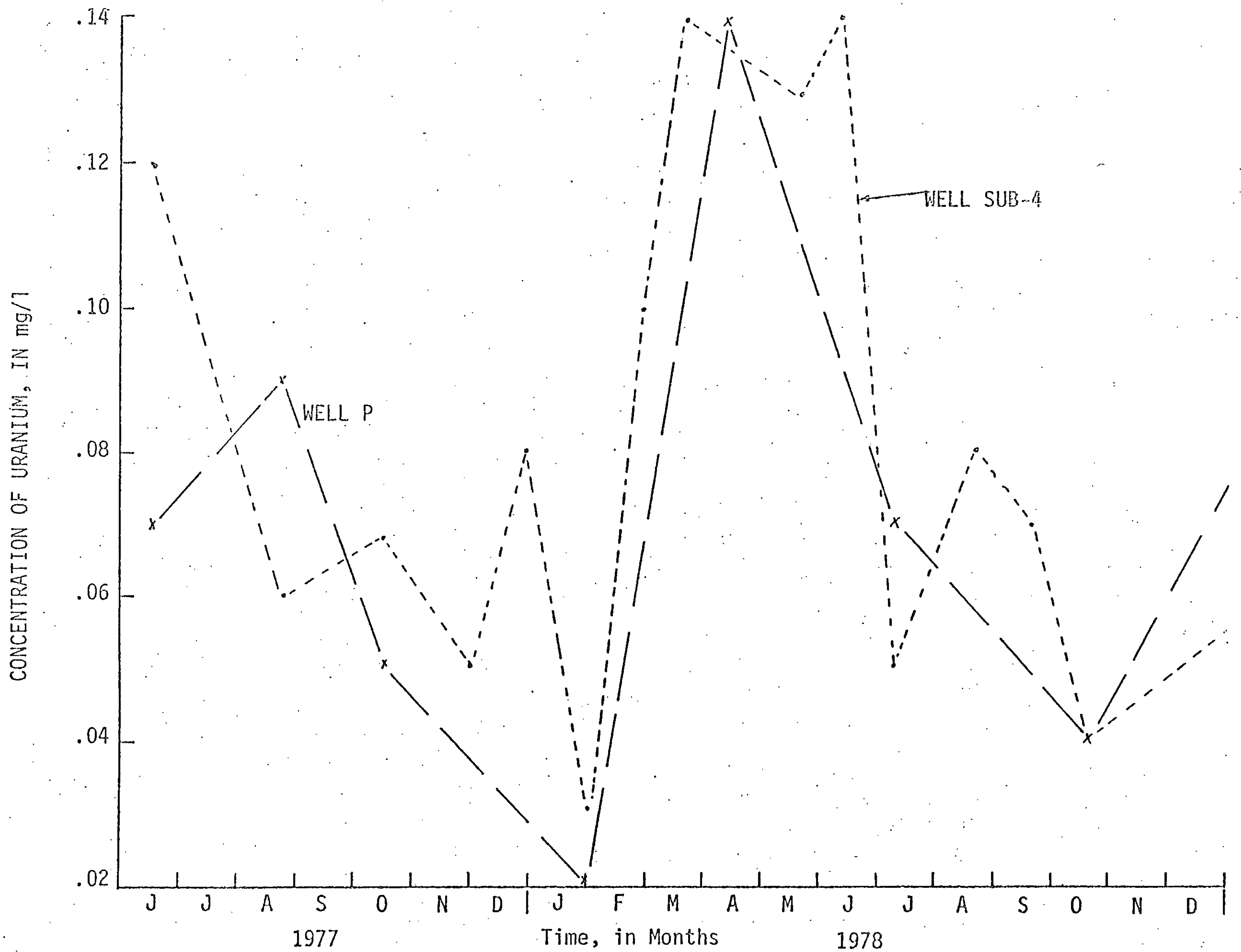


FIGURE 52. URANIUM CONCENTRATIONS FOR WELLS SUB-4 AND P (1977 & 1978)

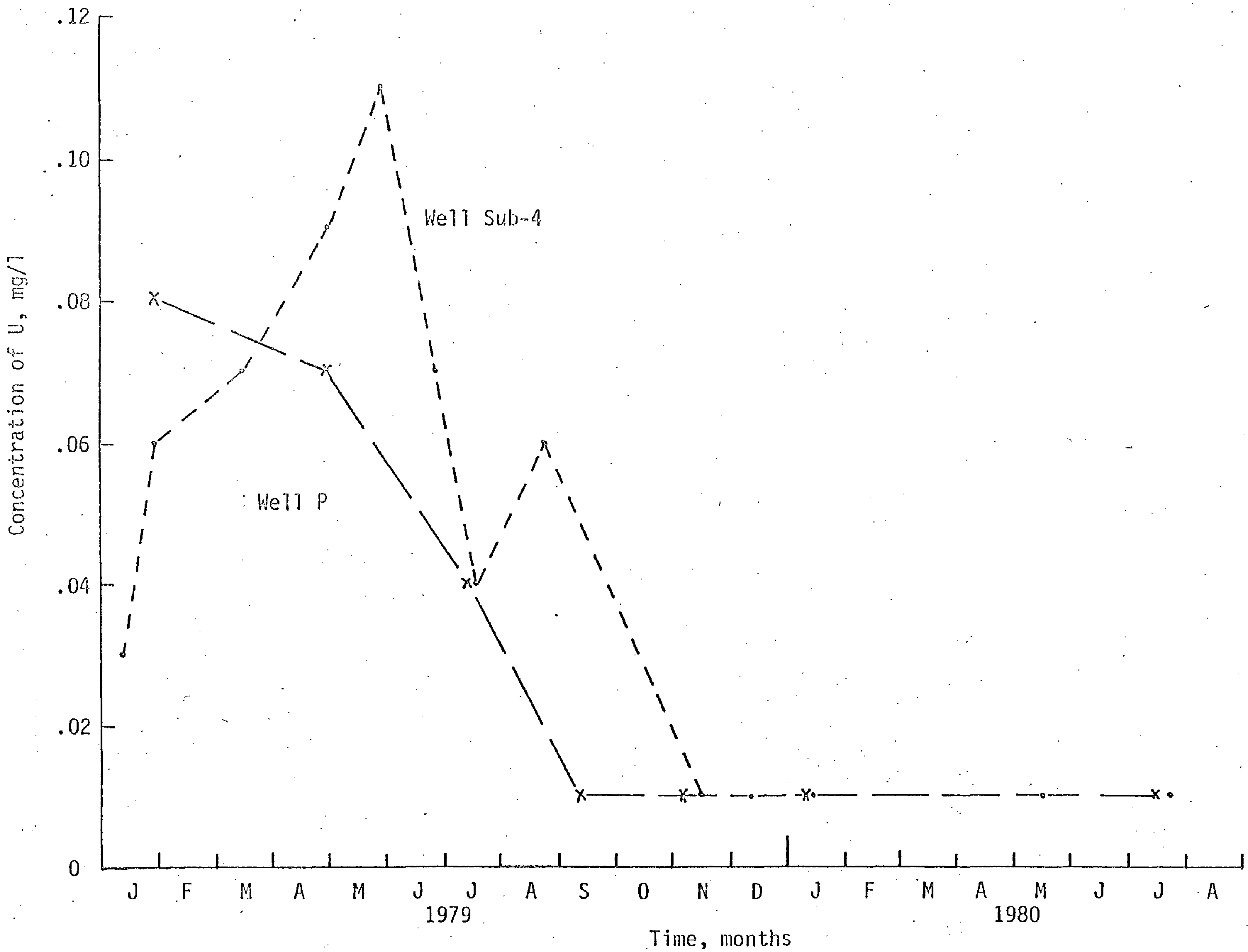


FIGURE 53. URANIUM CONCENTRATIONS FOR WELLS SUB-4 AND P (1979 & 1980)

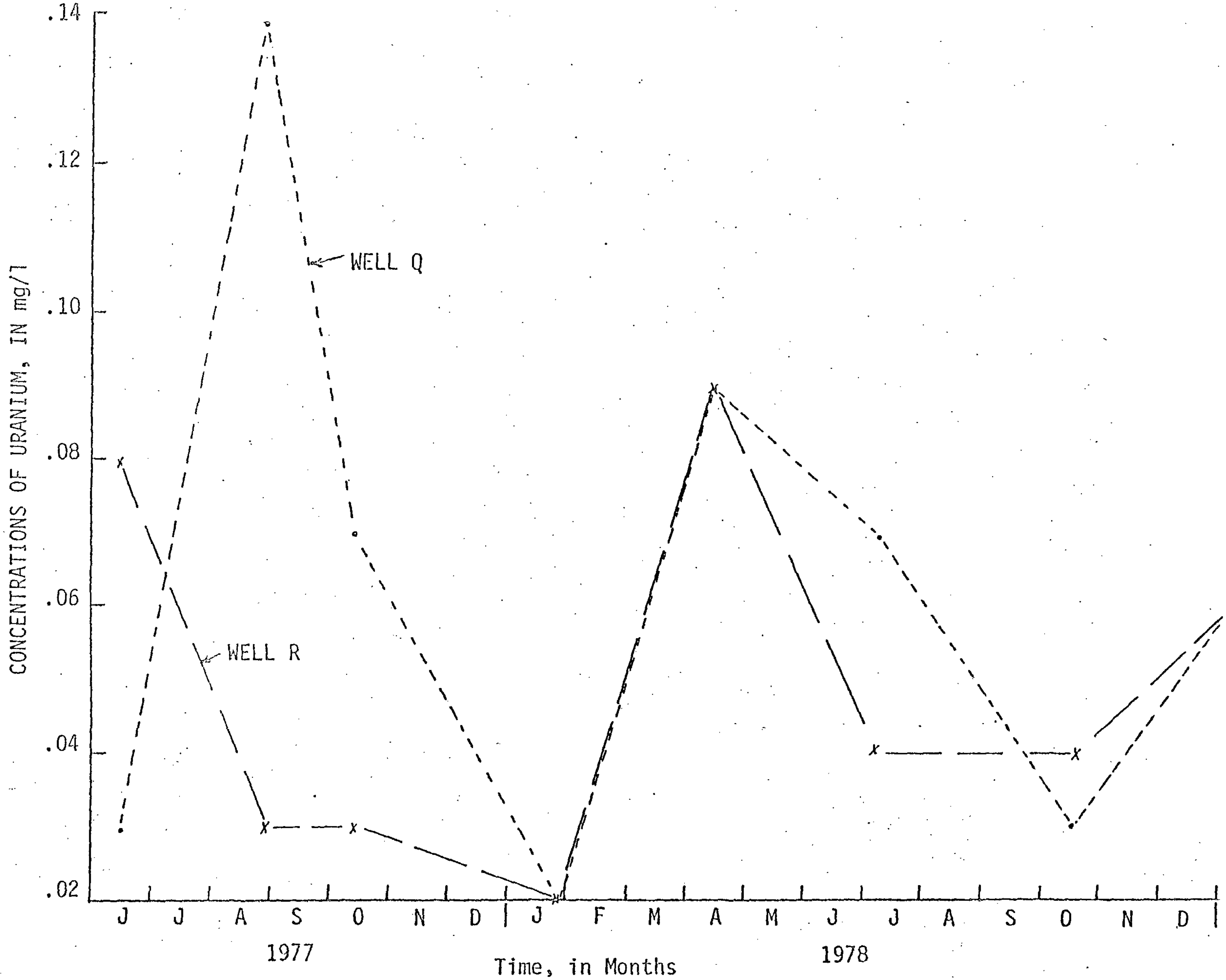


FIGURE 54. URANIUM CONCENTRATIONS FOR WELLS Q AND R (1977 & 1978)

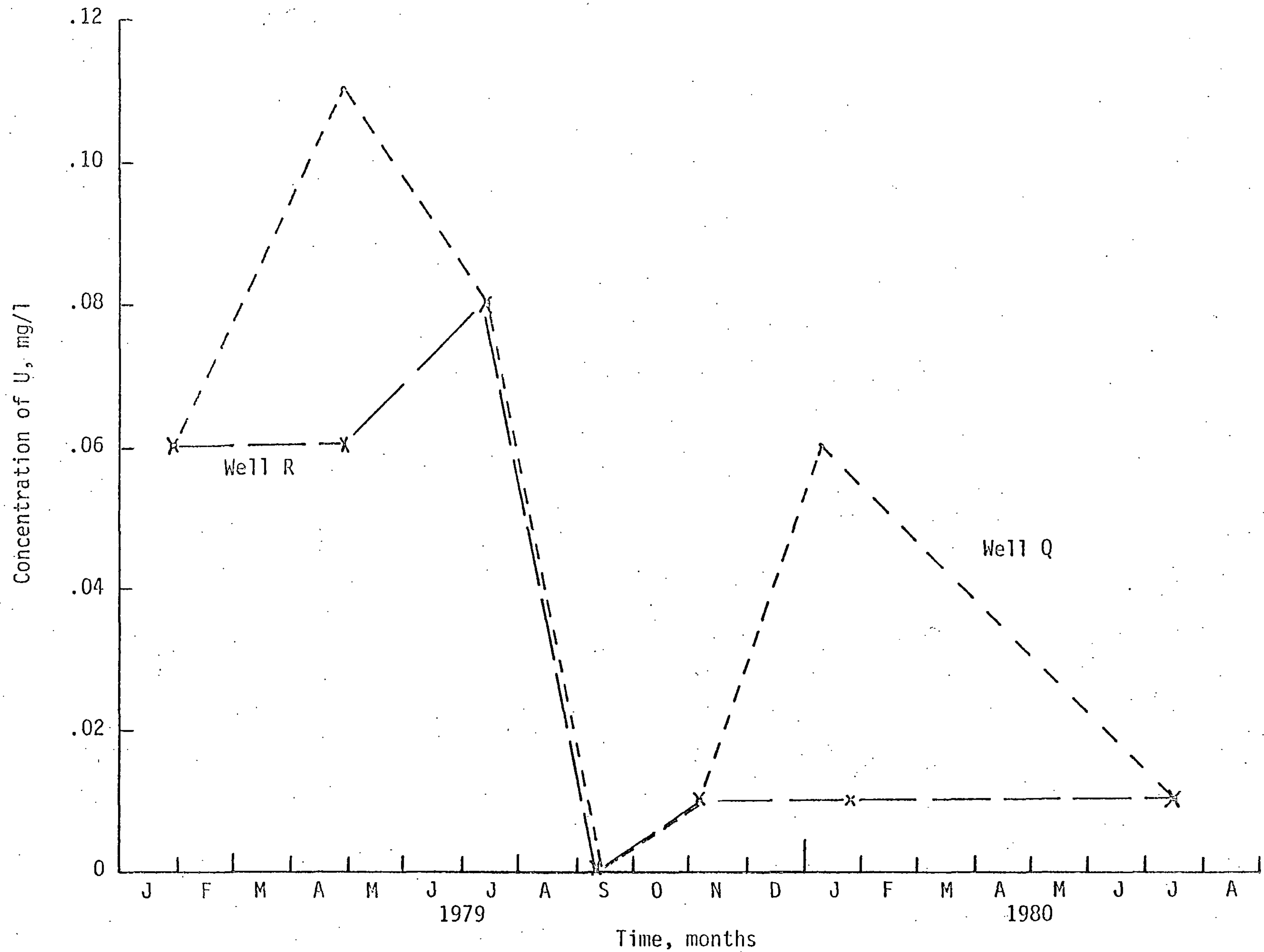


FIGURE 55. URANIUM CONCENTRATIONS FOR WELLS Q AND R (1979 & 1980)

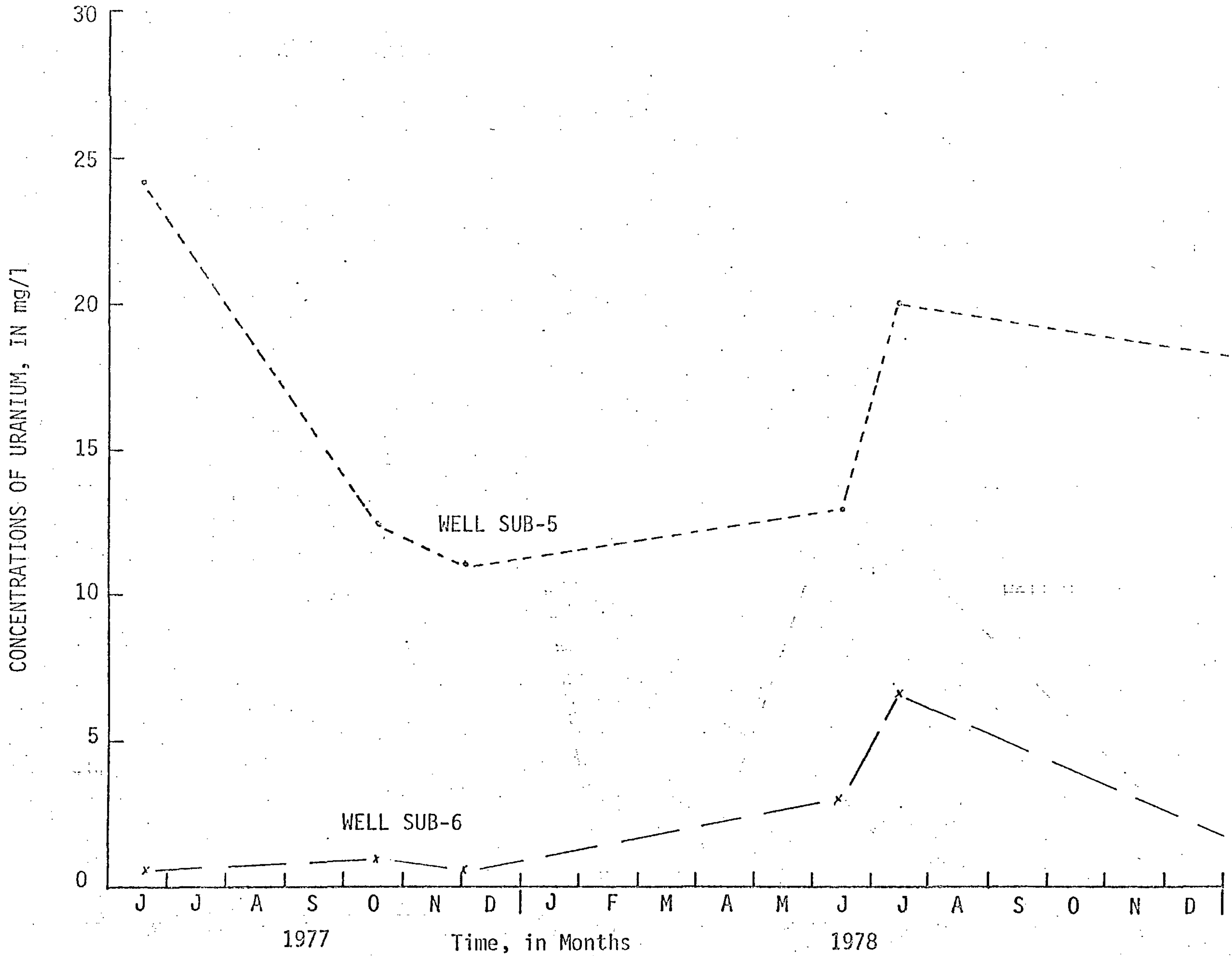


FIGURE 56. URANIUM CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1977 & 1978)

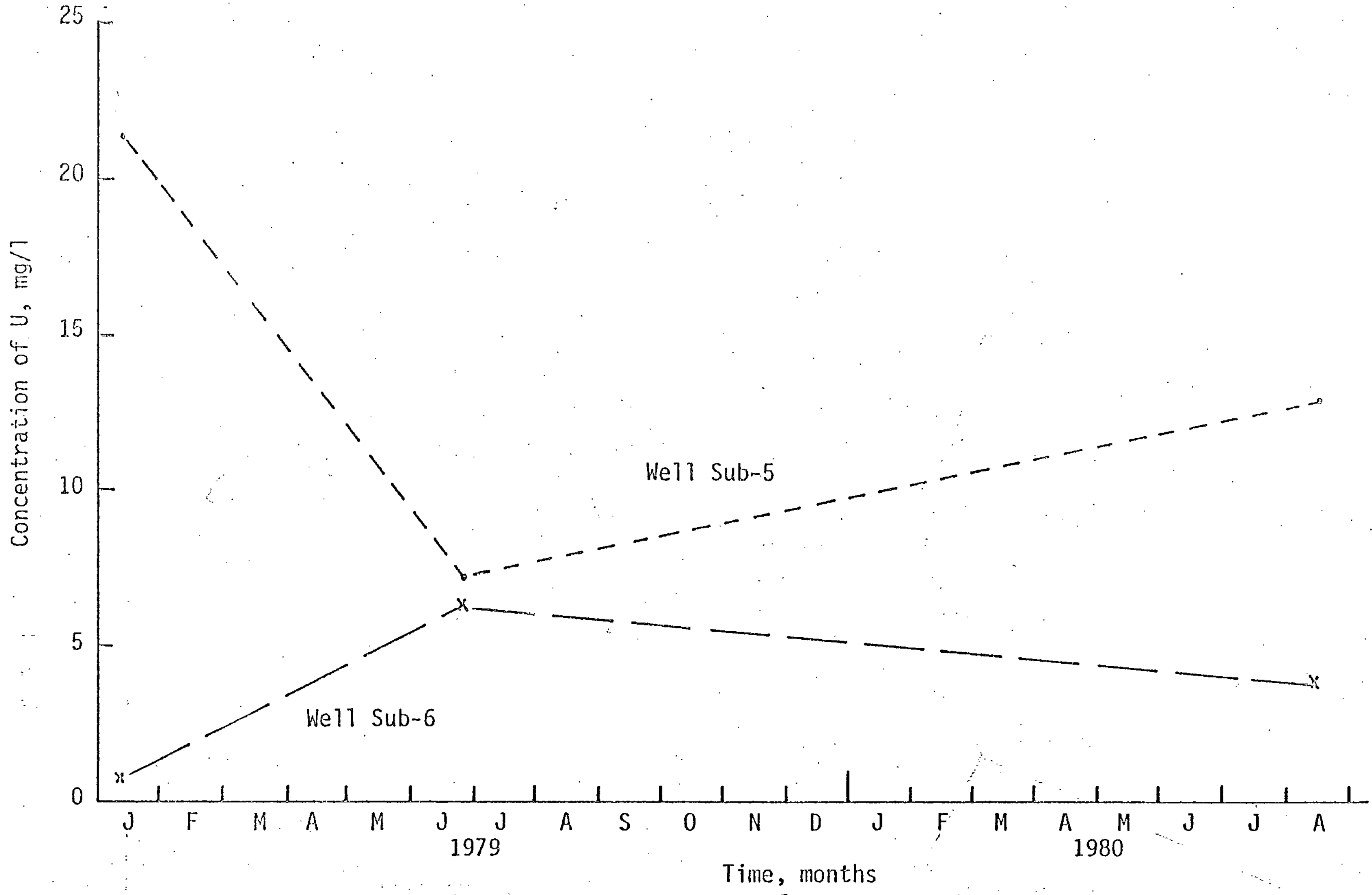


FIGURE 57. URANIUM CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1979 & 1980)

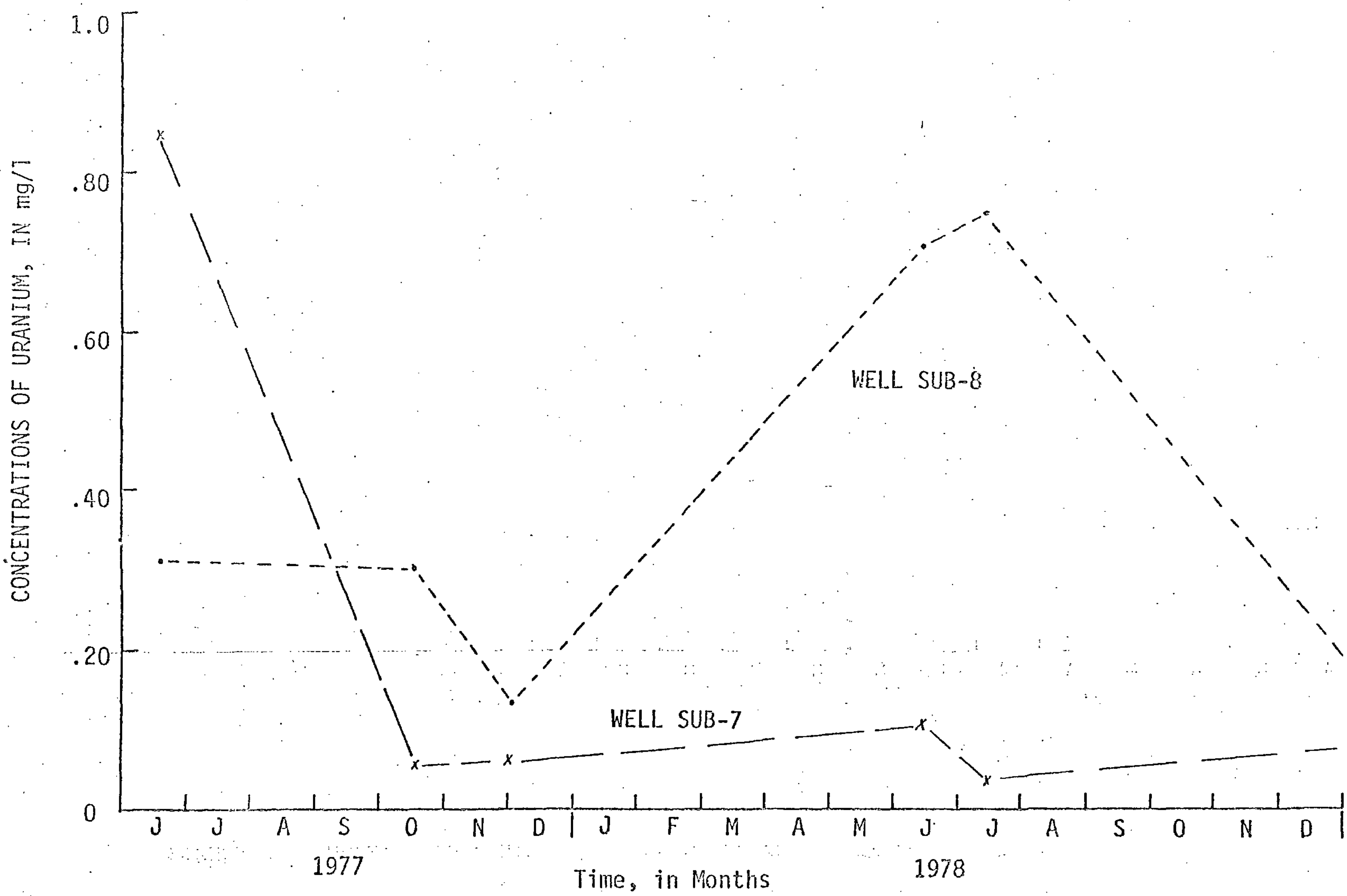


FIGURE 58. URANIUM CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8. (1977 & 1978)

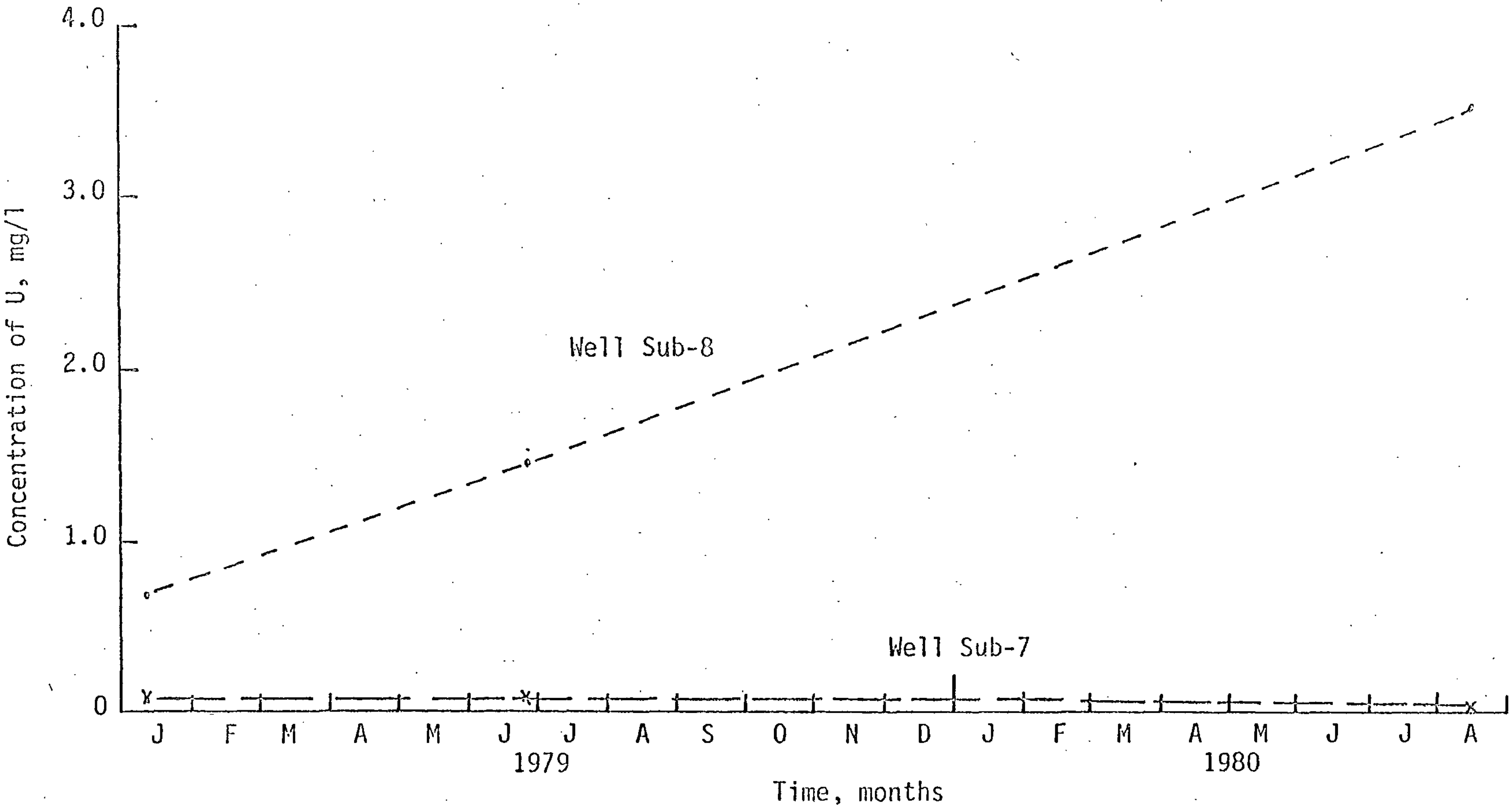


FIGURE 59. URANIUM CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8 (1979 & 1980)

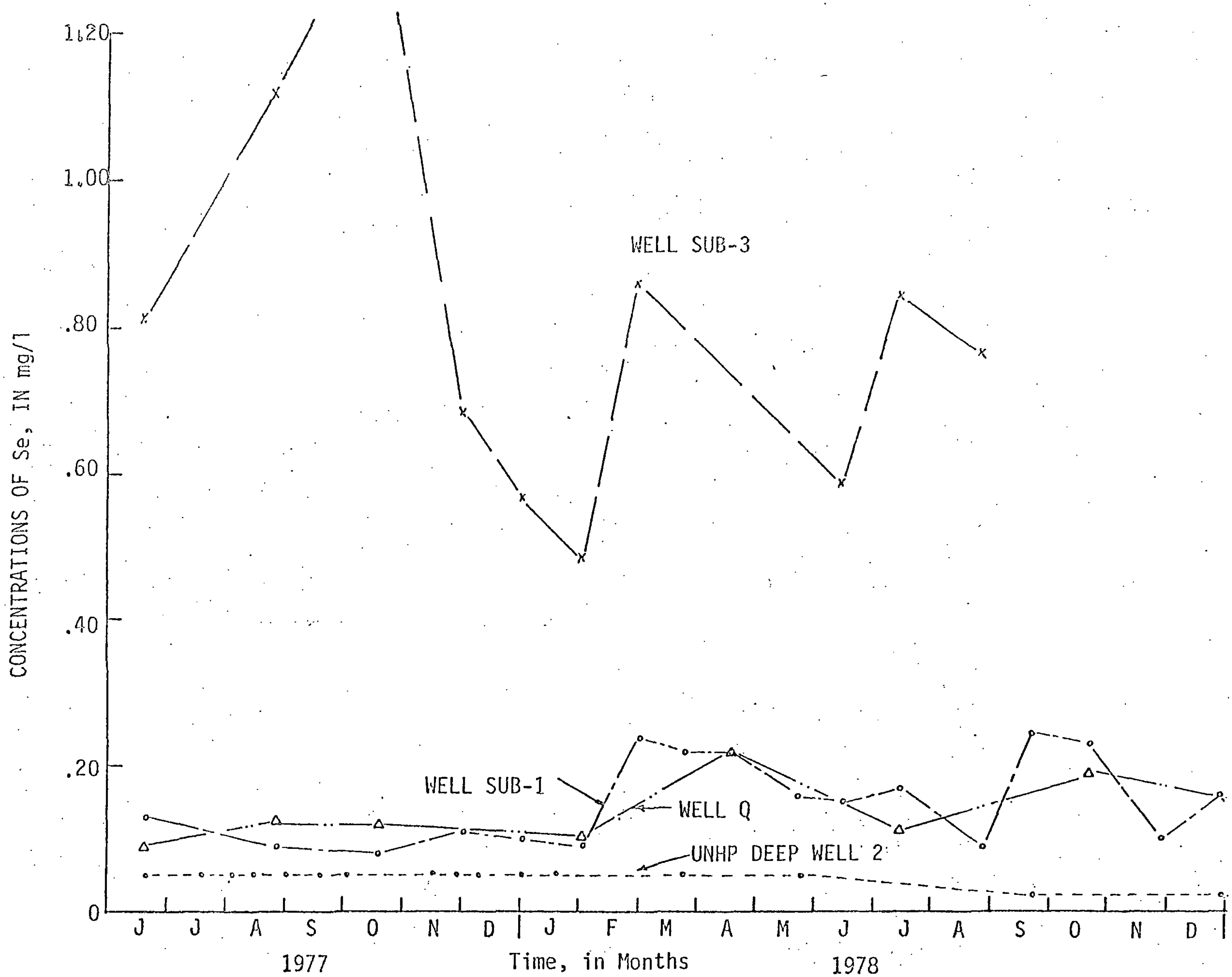


FIGURE 60. SELENIUM CONCENTRATIONS FOR WELLS SUB-1, SUB-3, Q AND UNHP DEEP WELL 2 (1977 & 1978)

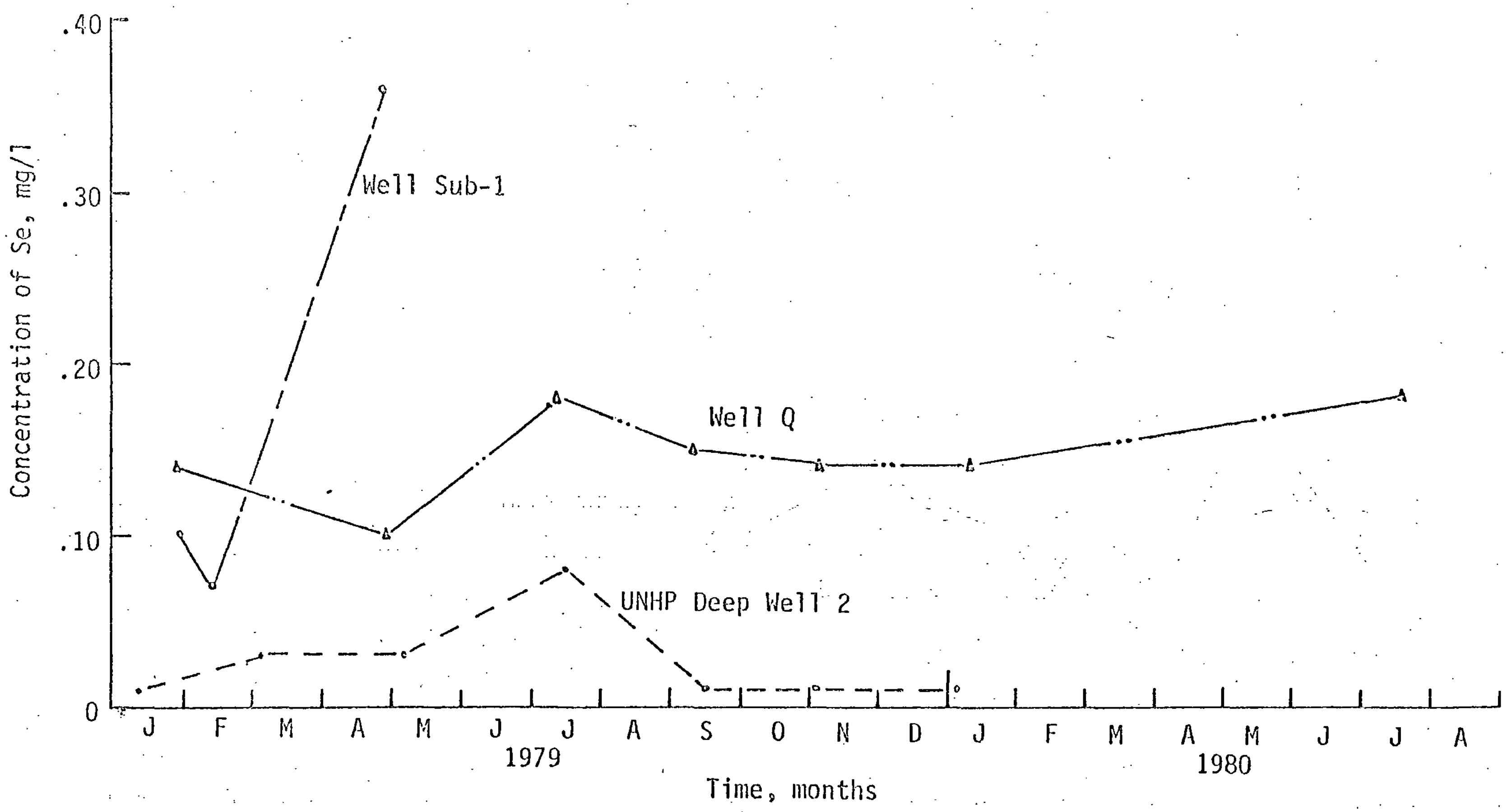


FIGURE 61. SELENIUM CONCENTRATIONS FOR WELLS SUB-1, Q, and UNHP DEEP WELL 2 (1979 & 1980)

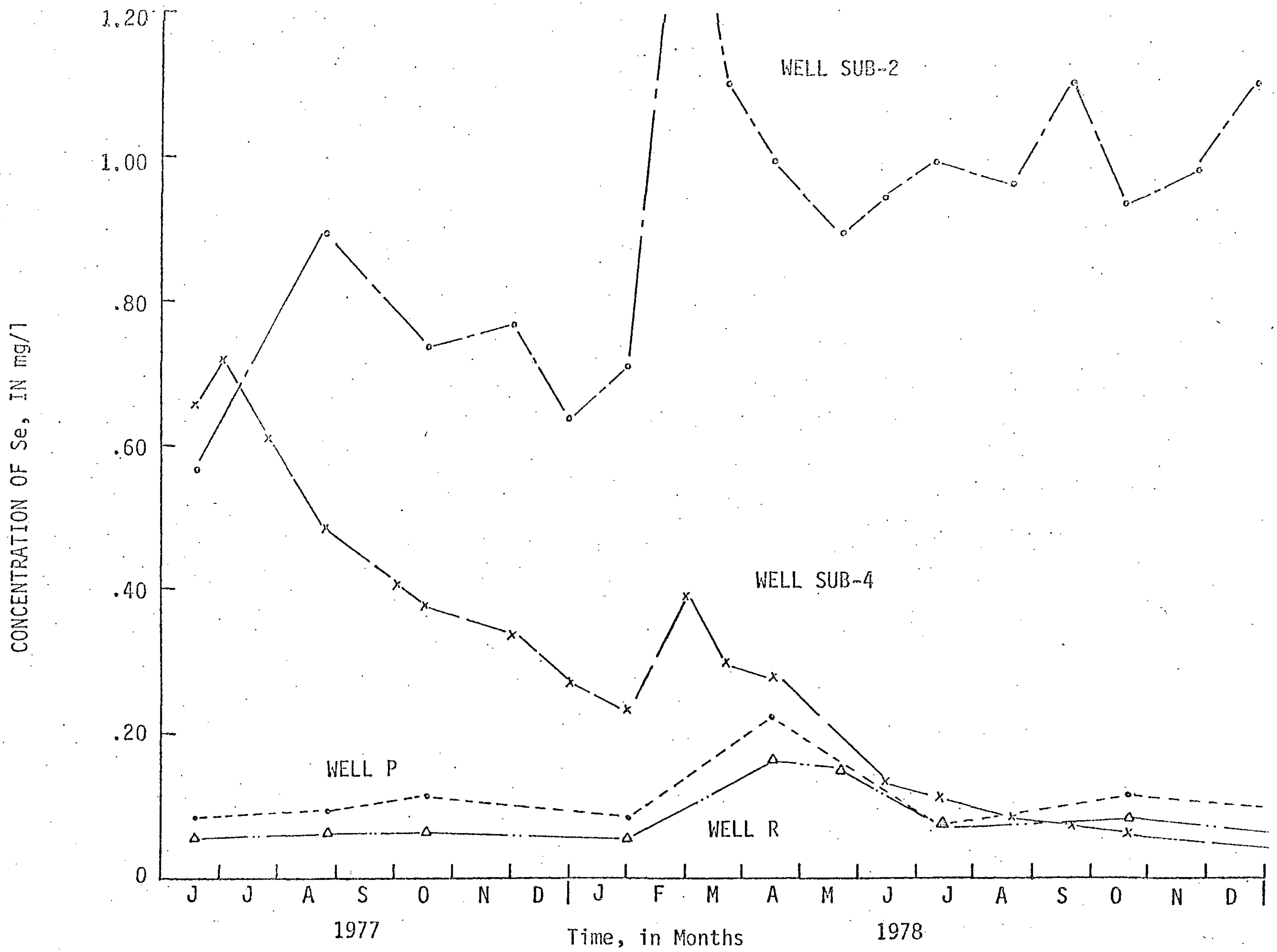


FIGURE 62. SELENIUM CONCENTRATIONS FOR WELLS SUB-2, SUB-4, P AND R. (1977 & 1978)

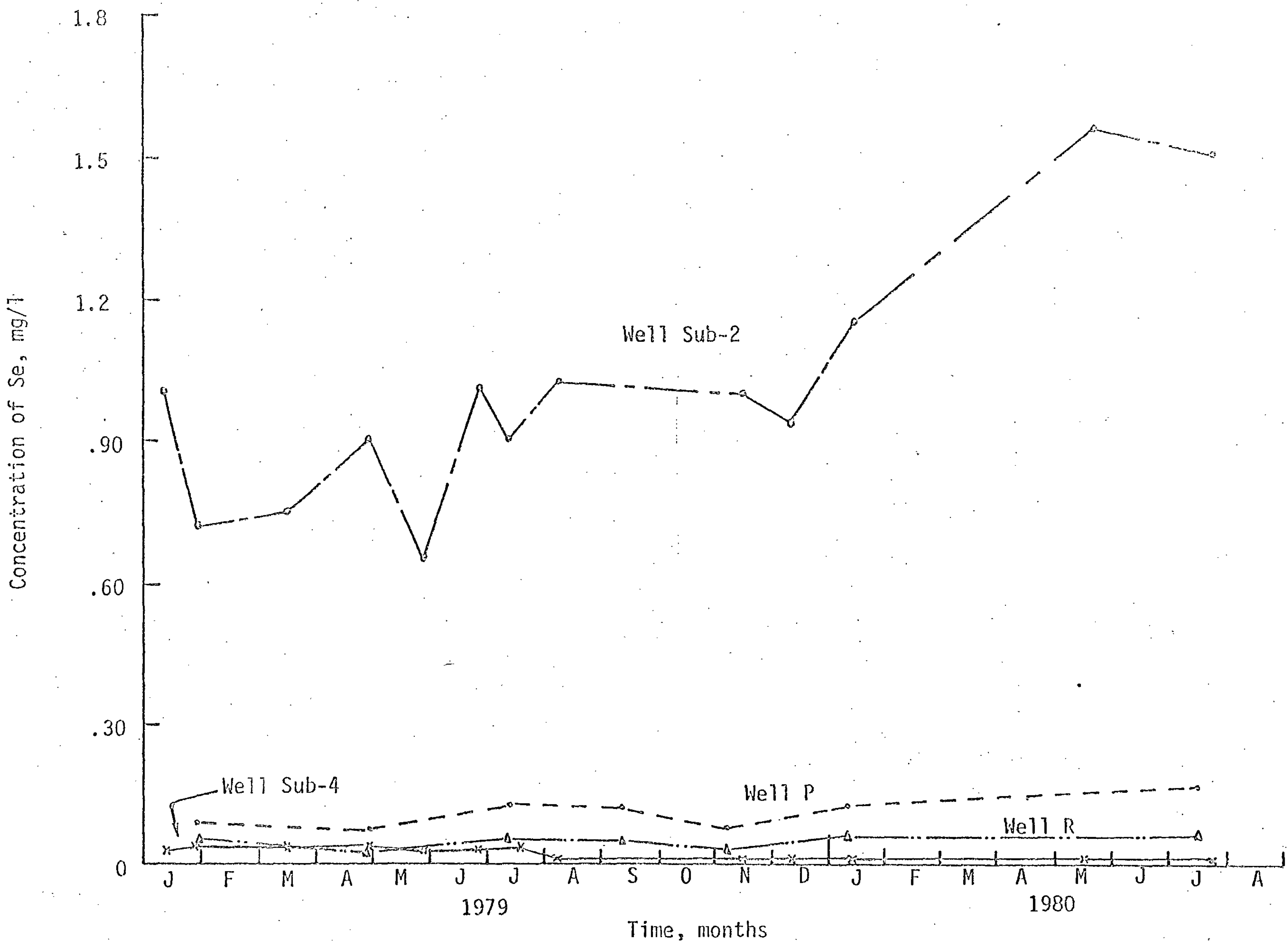


FIGURE 63. SELENIUM CONCENTRATIONS FOR WELLS SUB-2, SUB-4, P, AND R (1979 & 1980)

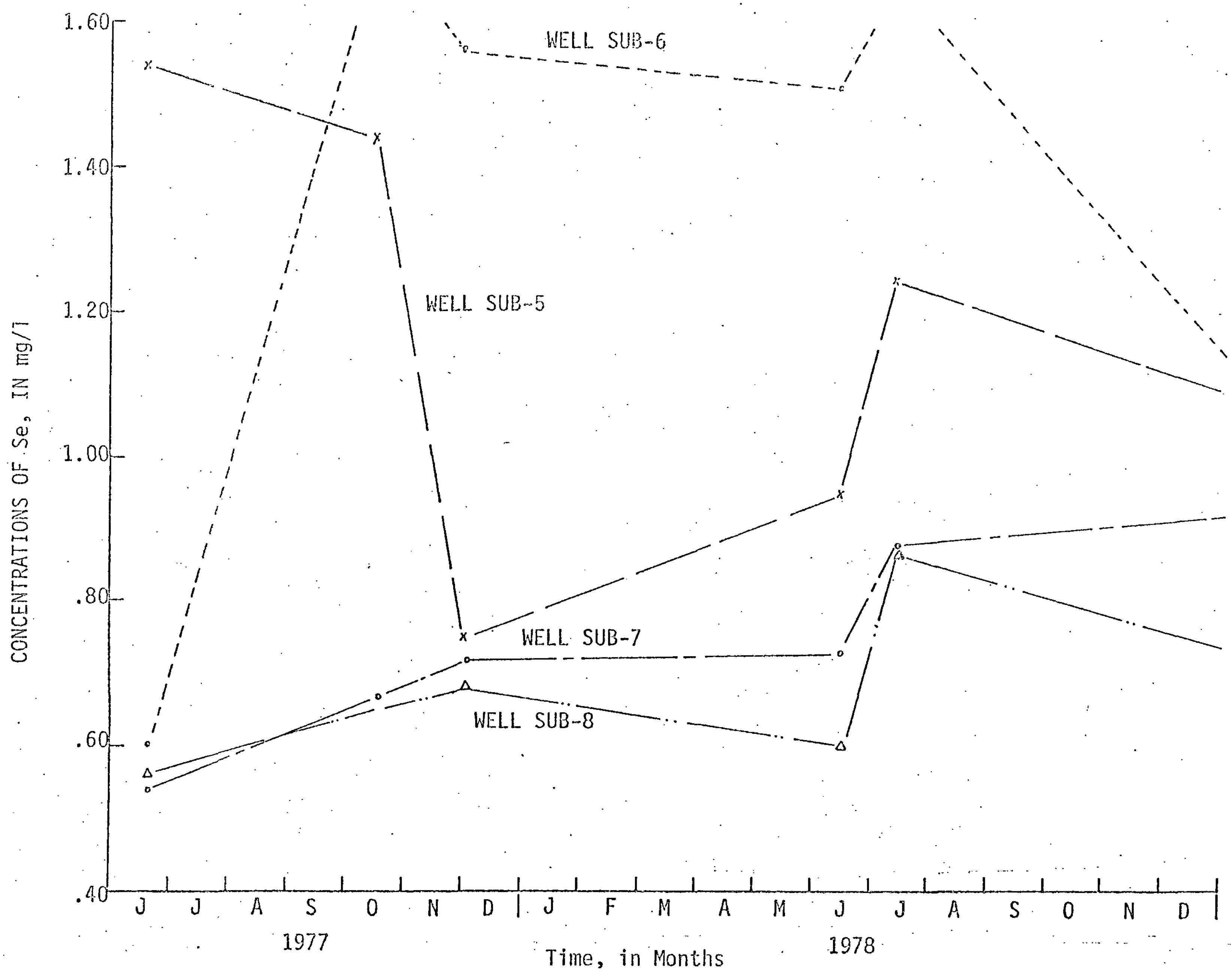


FIGURE 64. SELENIUM CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7, AND SUB-8 (1977 & 1978)

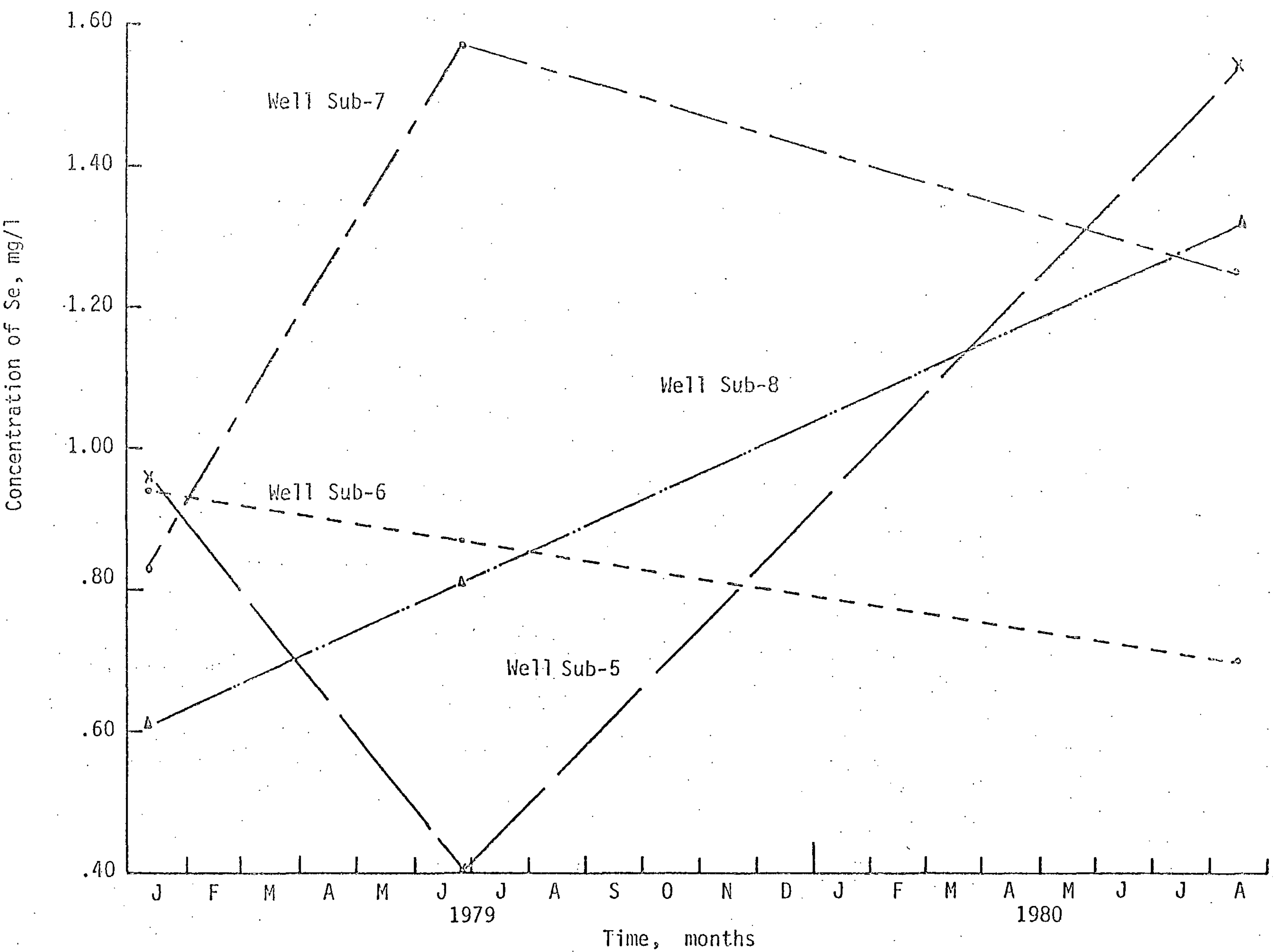


FIGURE 65. SELENIUM CONCENTRATIONS FOR WELLS SUB-5, SUB-6, SUB-7, AND SUB-8 (1979 & 1980)

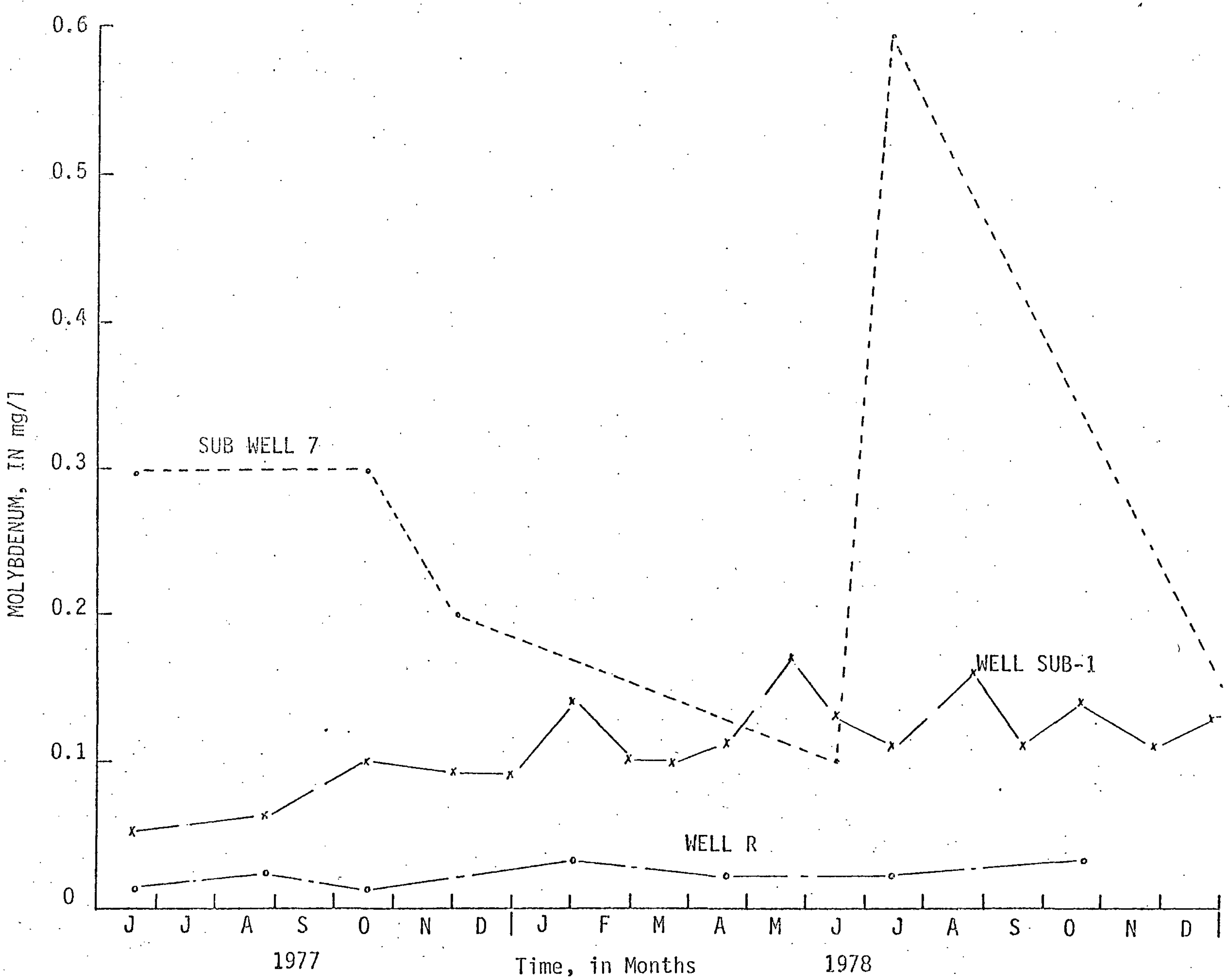


FIGURE 66. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-1, SUB-7, AND R (1977 & 1978)

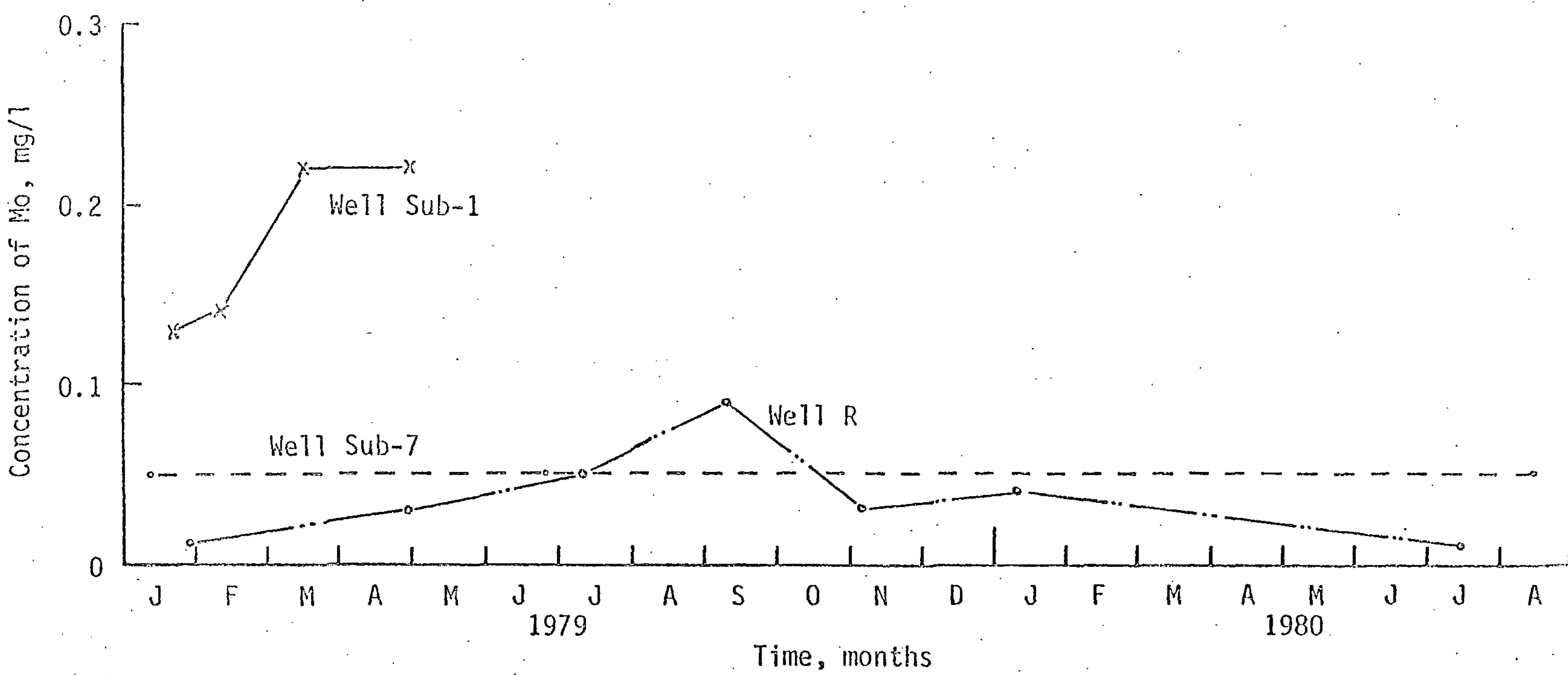


FIGURE 67. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-1, SUB-7, AND R (1979 & 1980)

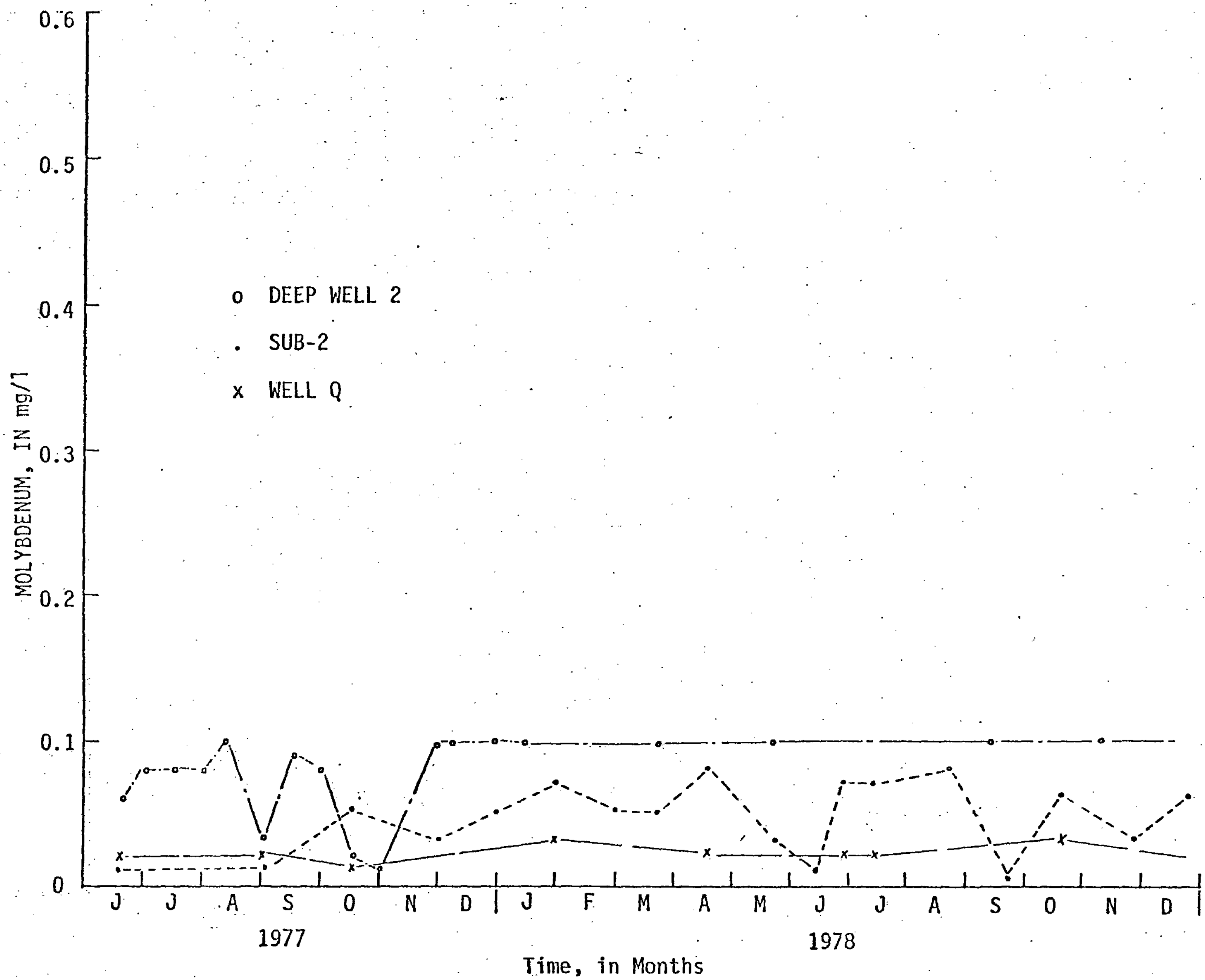


FIGURE 68. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-2, Q AND DEEP WELL 2 (1977 & 1978)

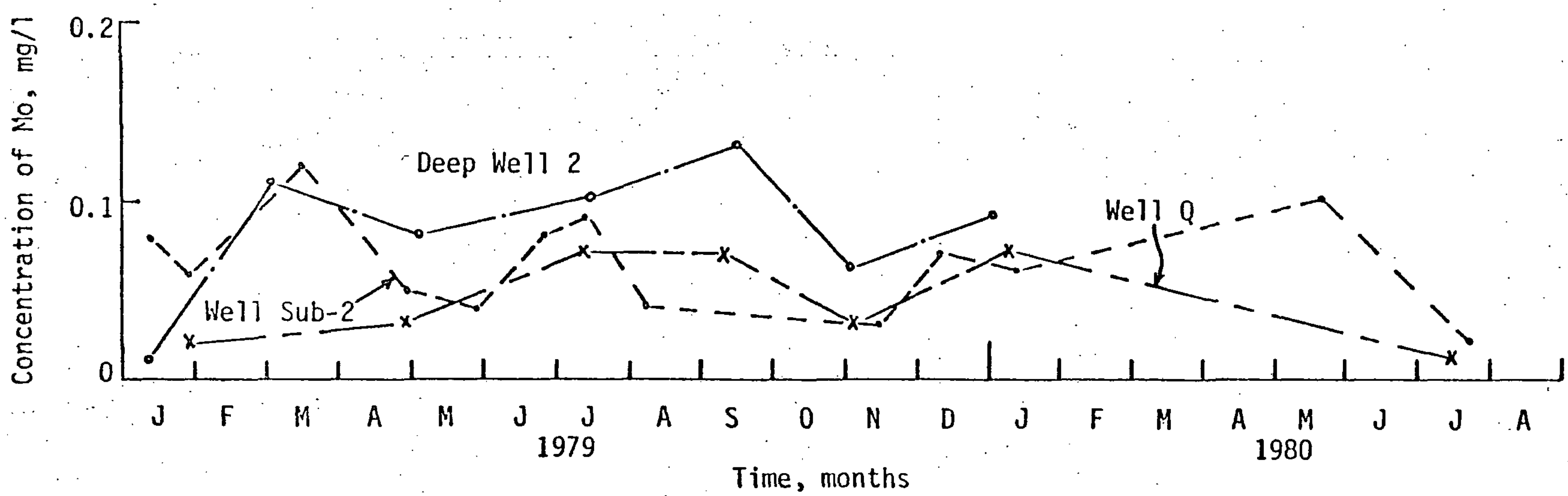


FIGURE 69. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-2, Q, AND DEEP WELL 2 (1979 & 1980)

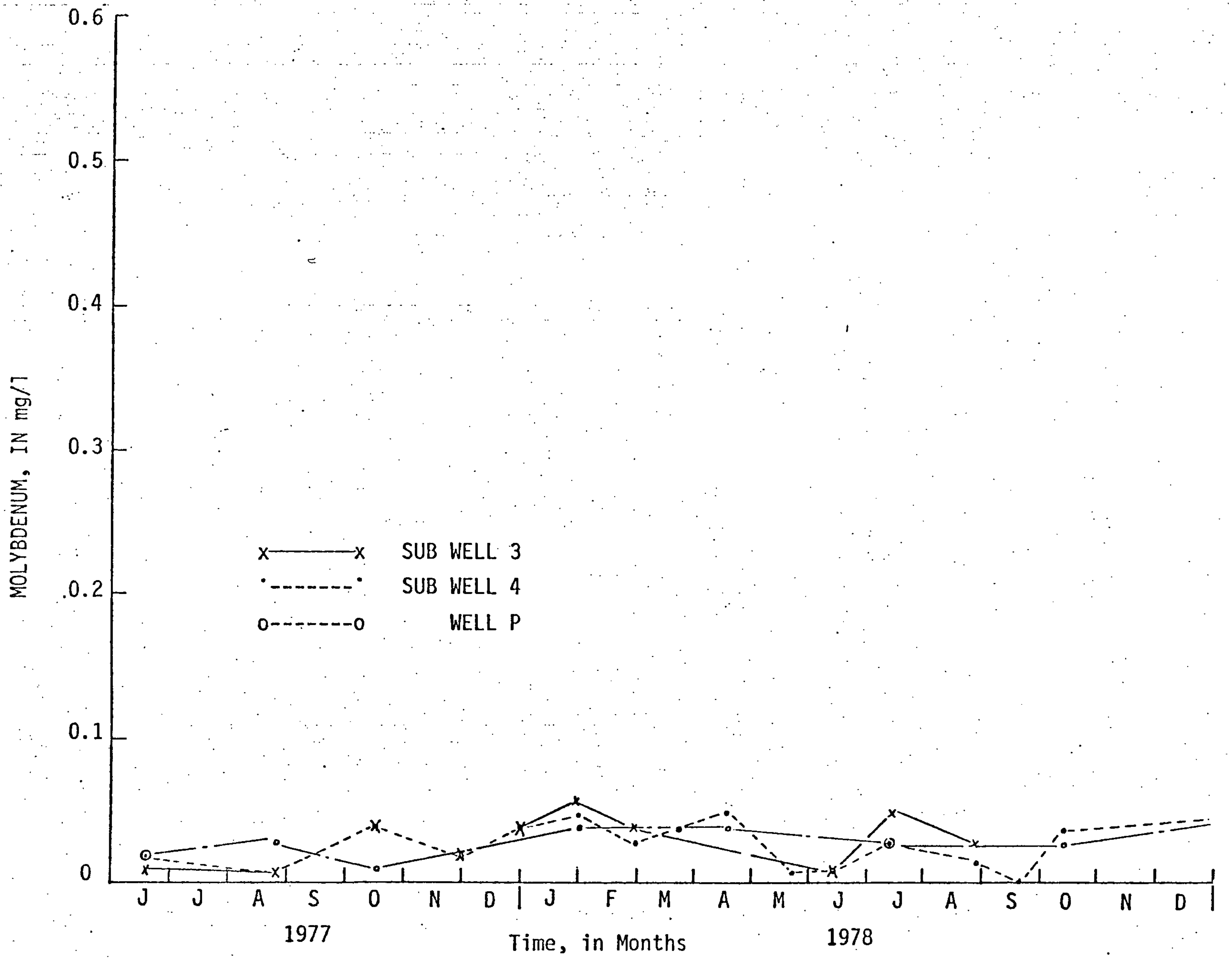


FIGURE 70. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-3, SUB-4 AND P (1977 & 1978)

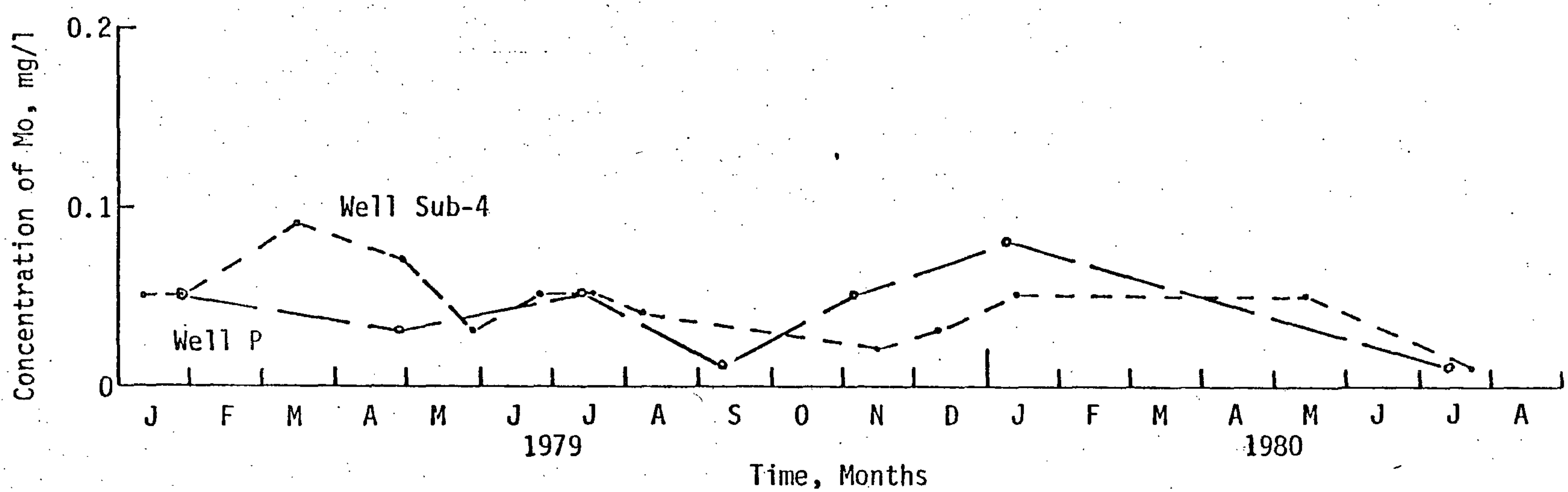


FIGURE 71. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-4 AND P (1979 & 1980)

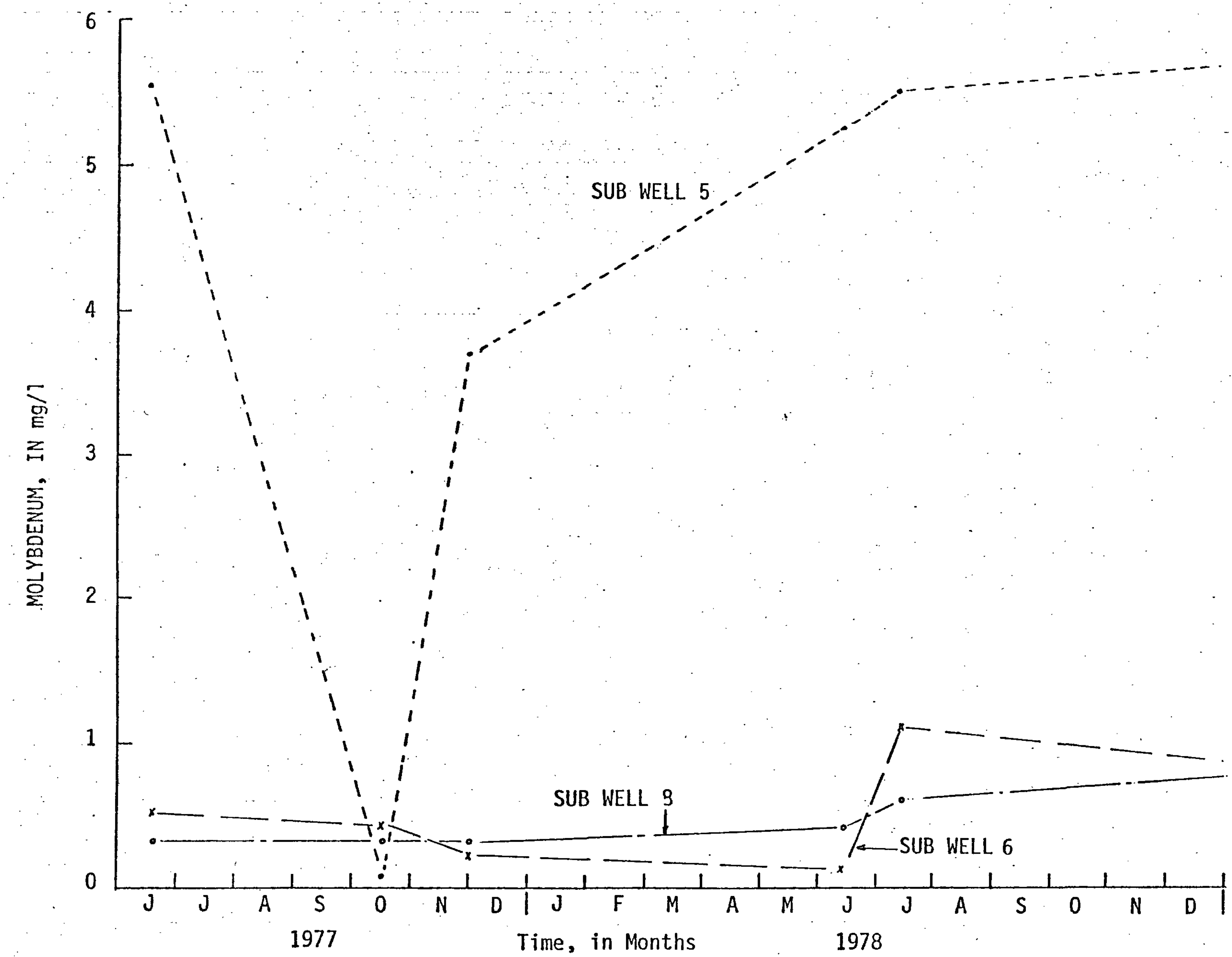


FIGURE 72. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-5, SUB-6 AND SUB-8. (1977 & 1978)

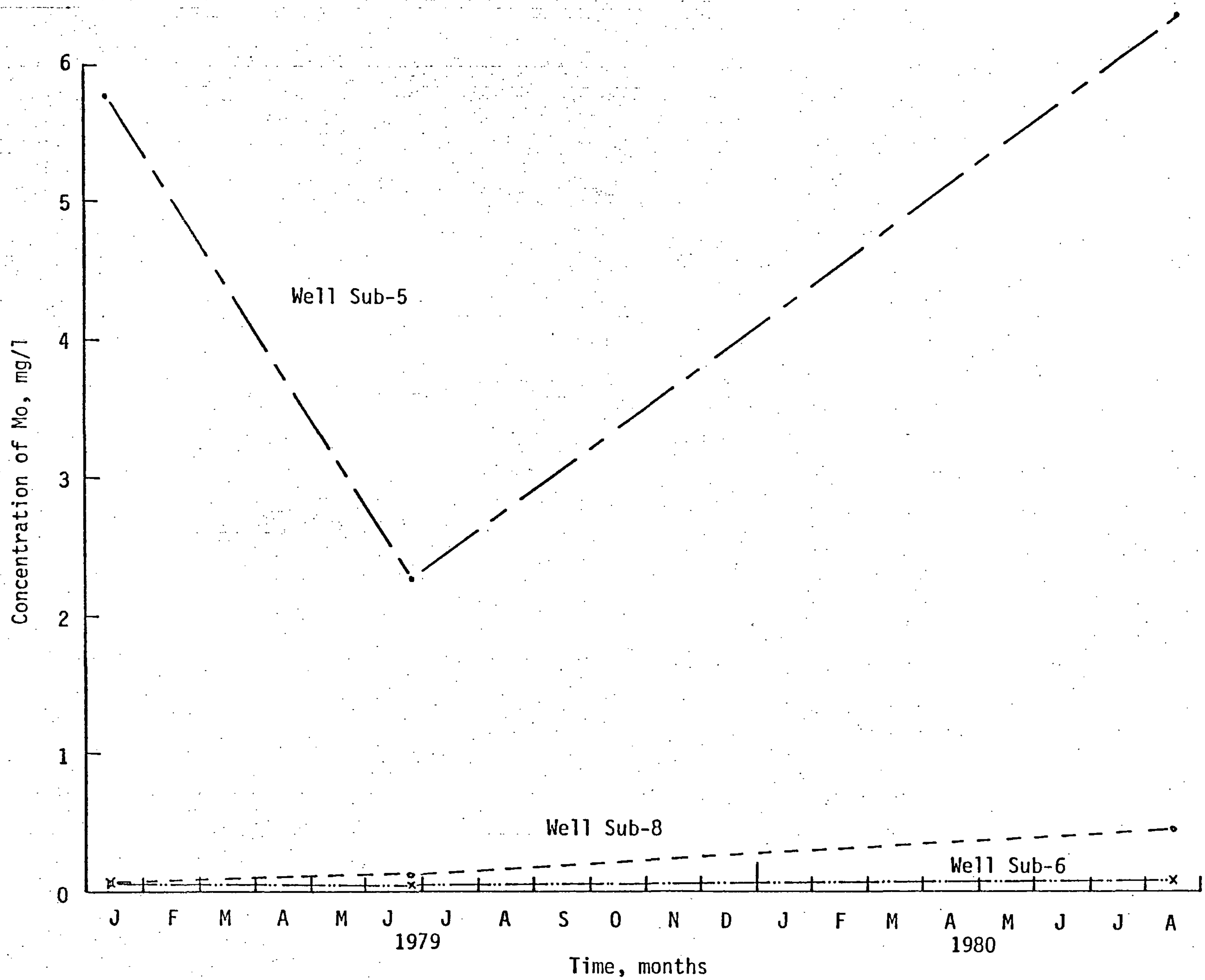


FIGURE 73. MOLYBDENUM CONCENTRATIONS FOR WELLS SUB-5, SUB-6, AND SUB-8 (1979 & 1980)

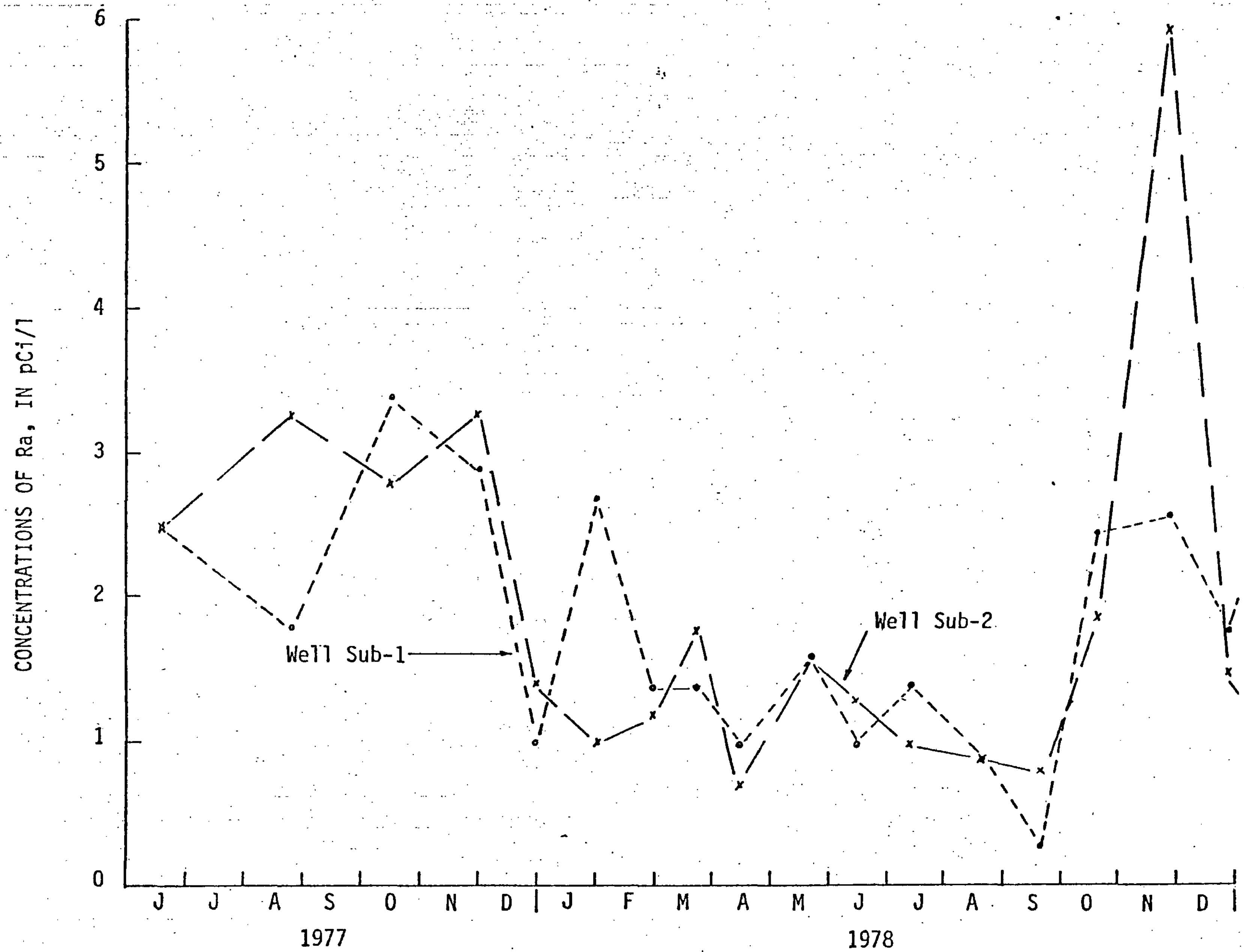


FIGURE 74. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-1 AND SUB-2 (1977 & 1978)

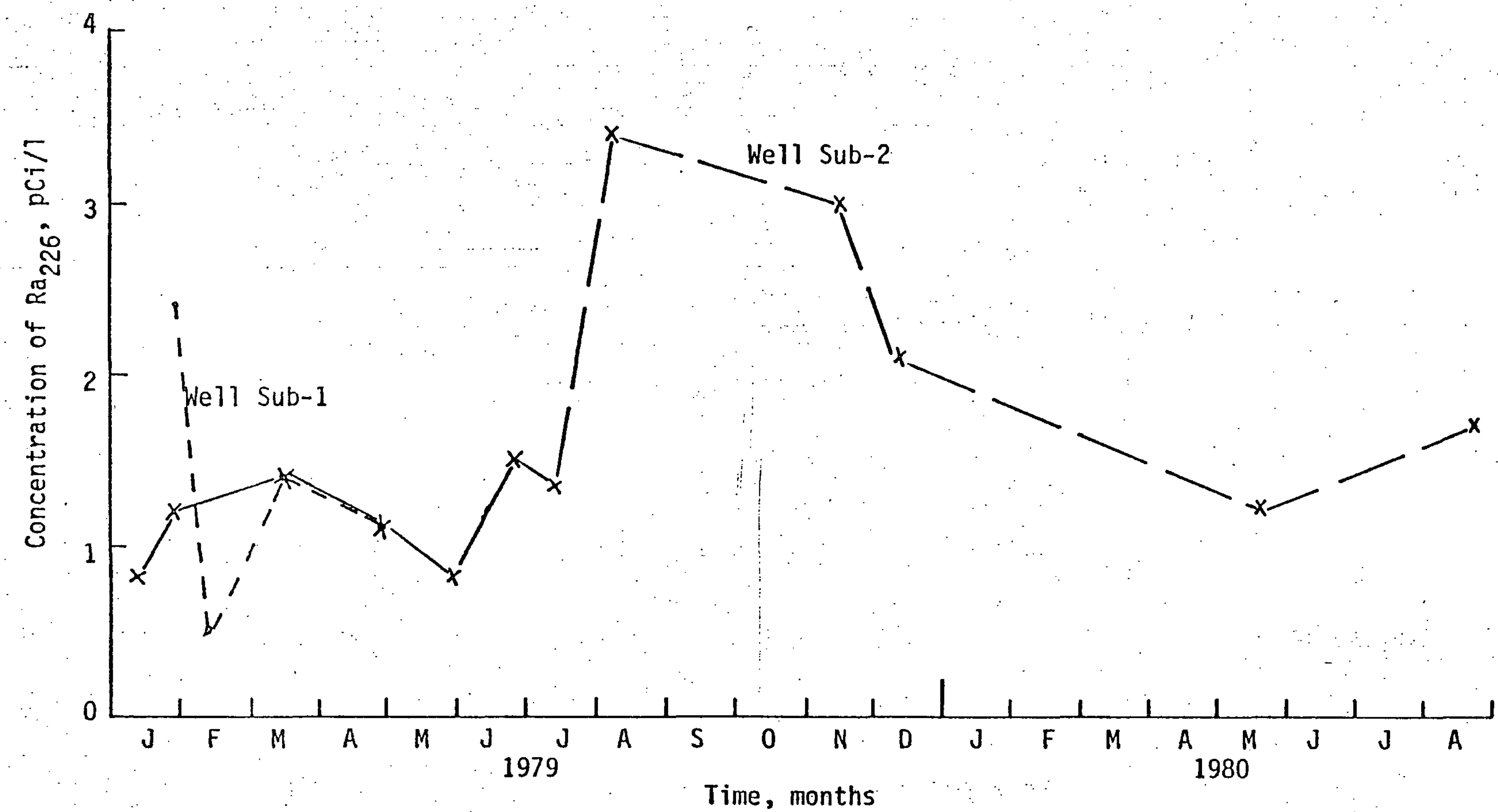


FIGURE 75. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-1 AND SUB-2 (1979 & 1980)

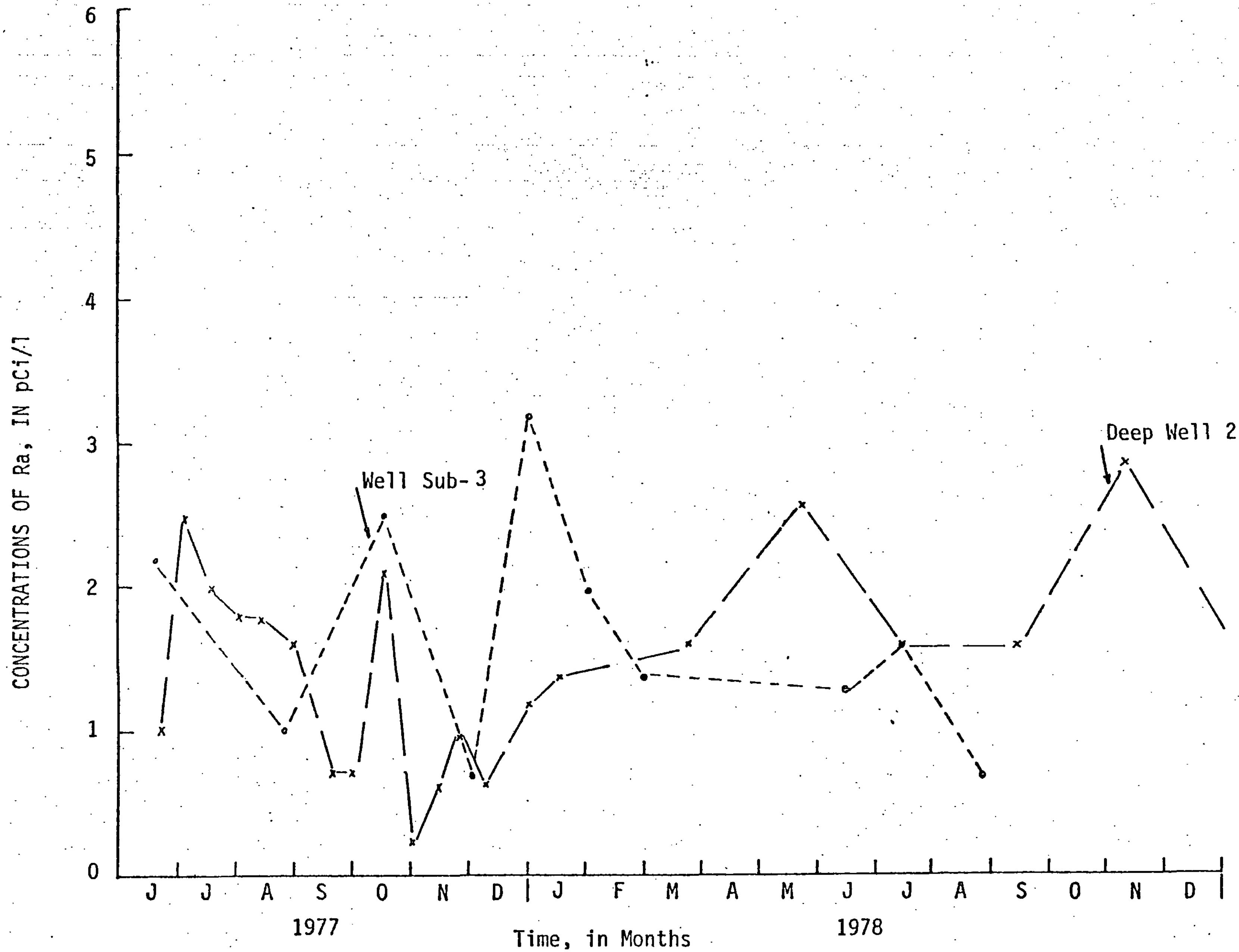


FIGURE 76. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-3 AND UNHP DEEP WELL 2 (1977 & 1978)

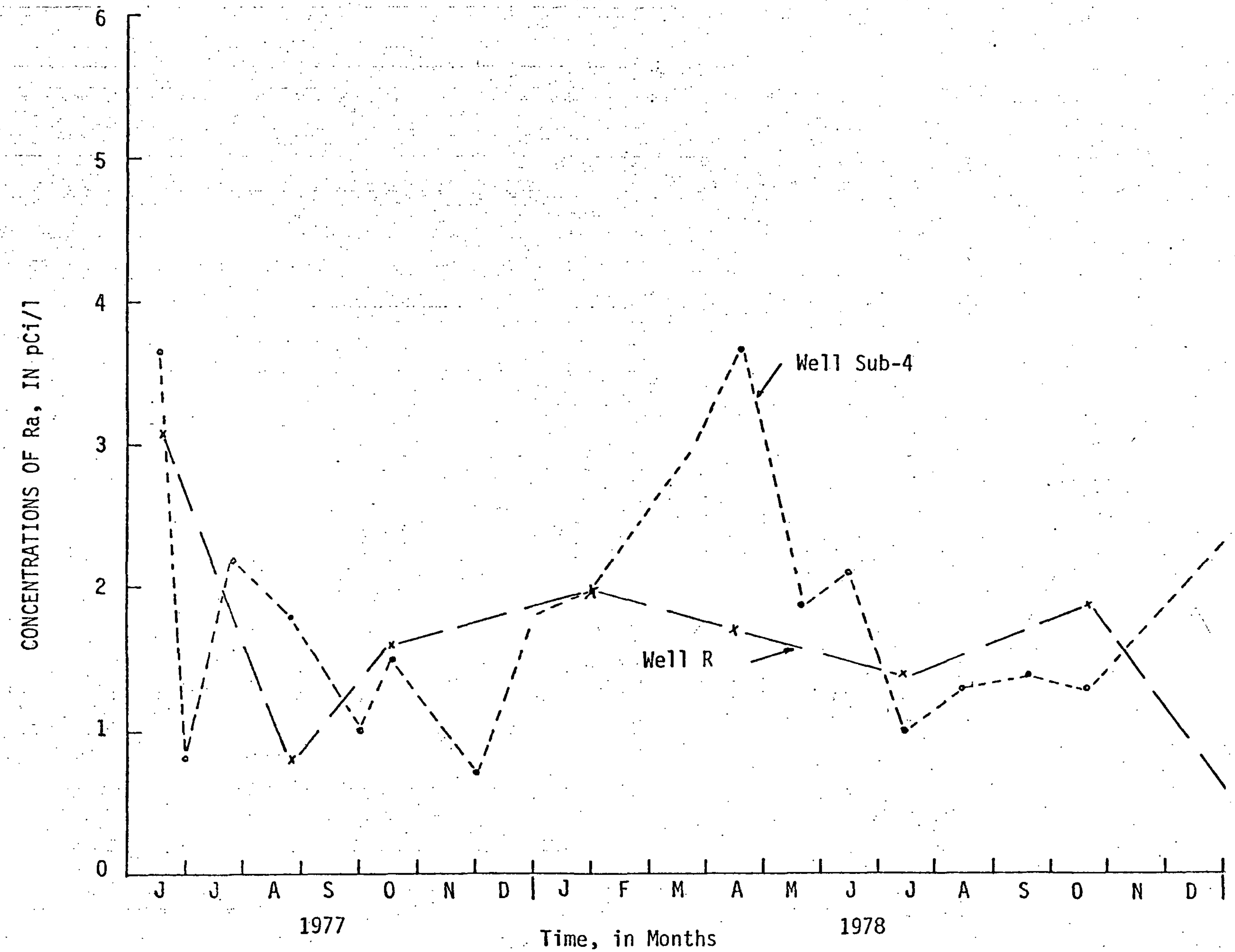


FIGURE 77. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-4 AND WELL R (1977 & 1978)

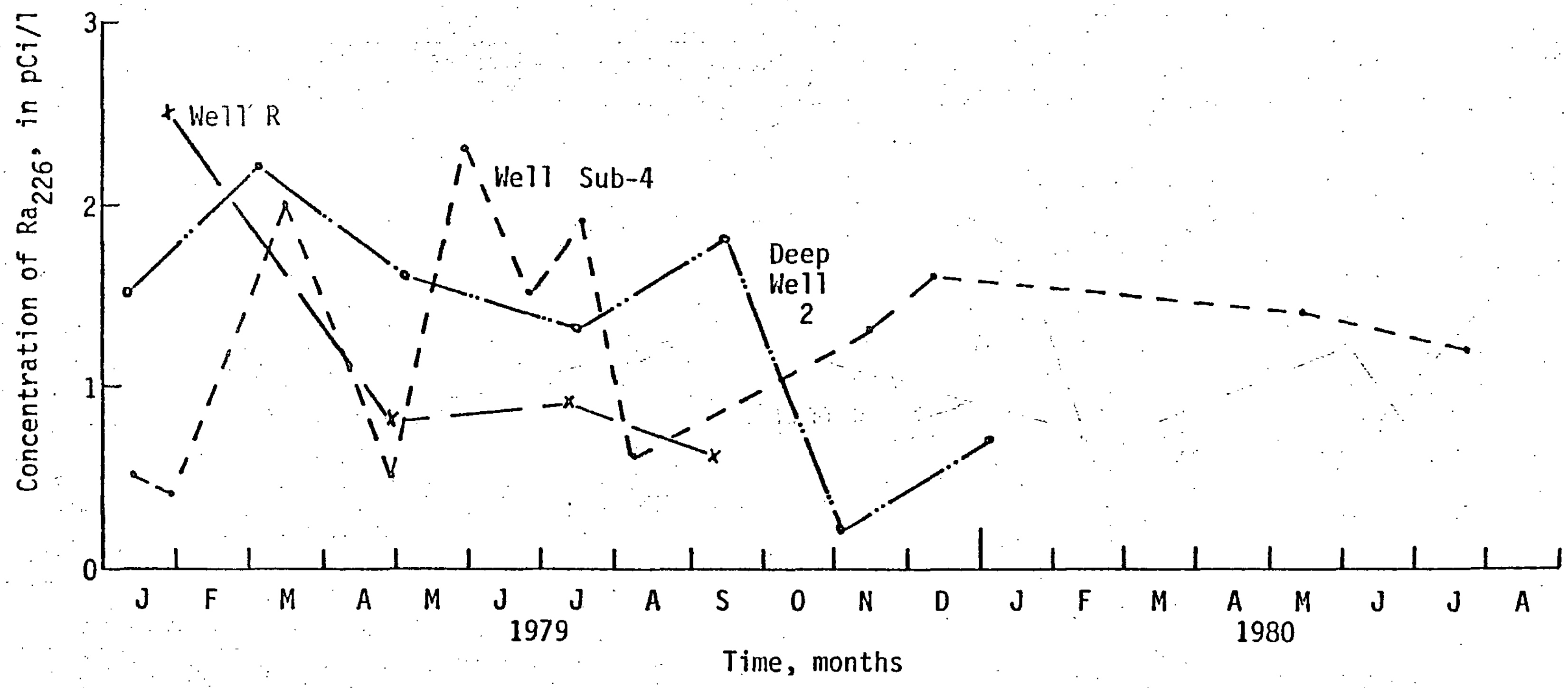


FIGURE 78. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-4, UNHP DEEP WELL 2 AND R (1979 & 1980)

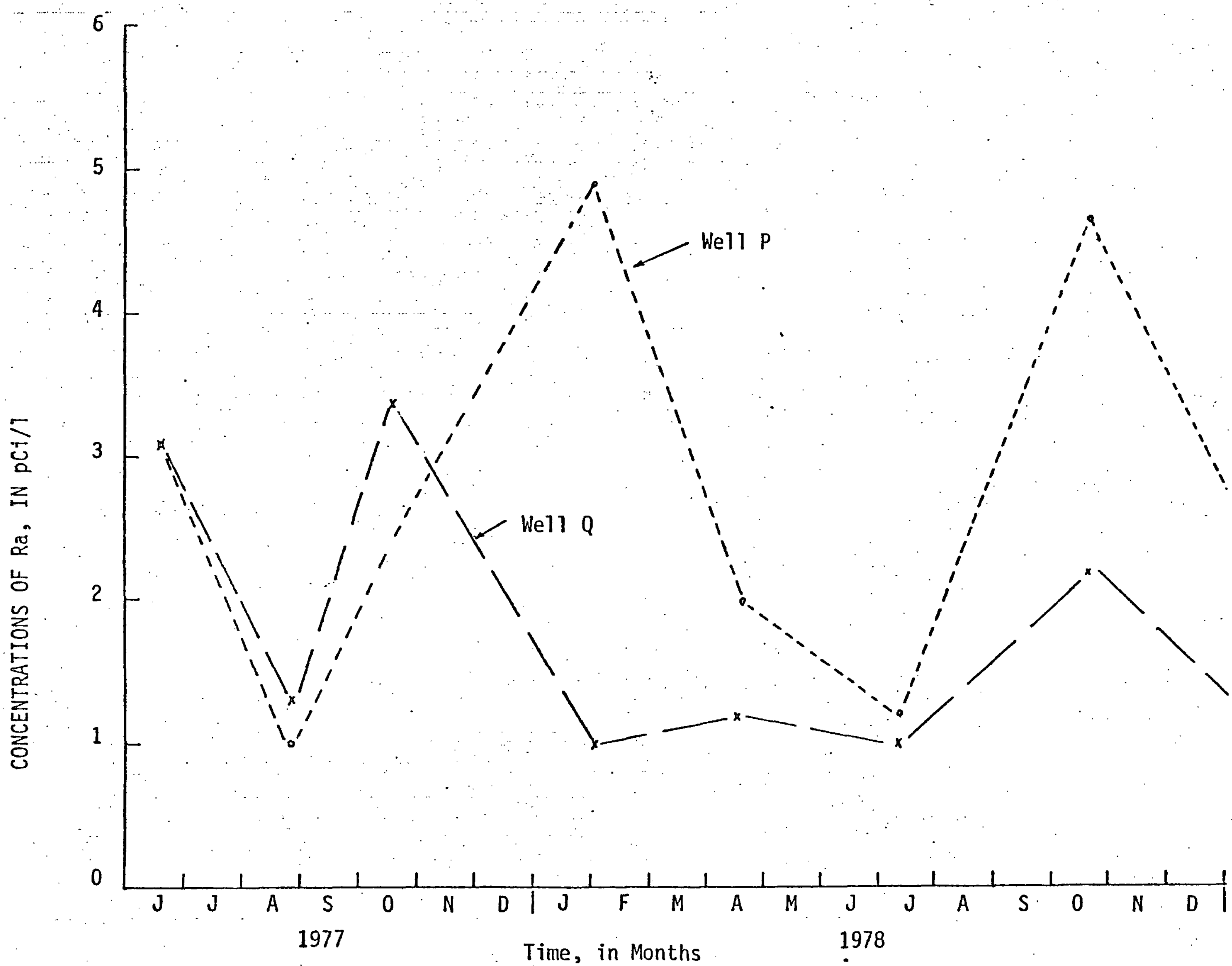


FIGURE 79. RADIUM 226 CONCENTRATIONS FOR WELLS P AND Q (1977 & 1978)

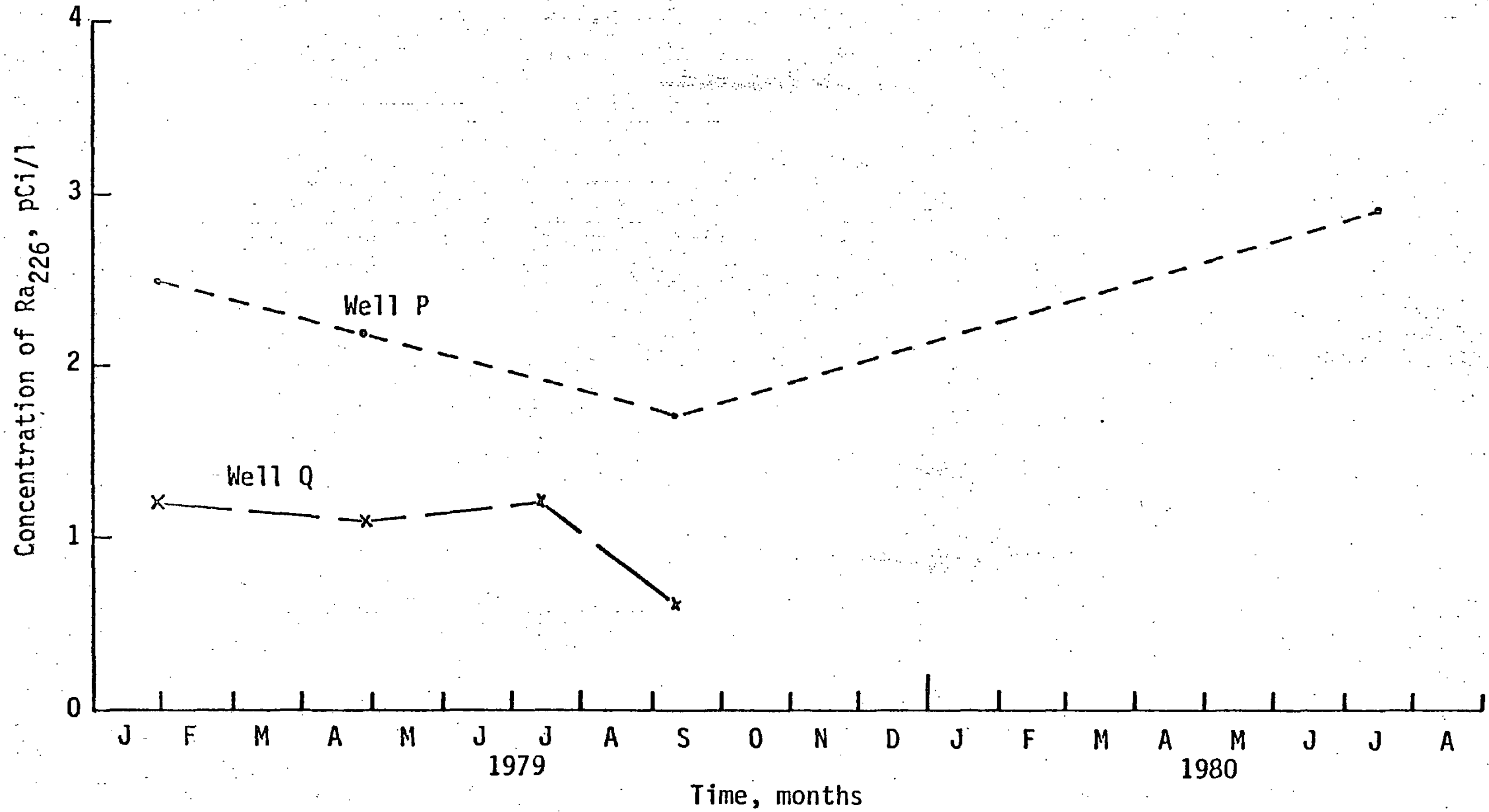


FIGURE 80. RADIUM 226 CONCENTRATIONS FOR WELLS P AND Q (1979 & 1980)

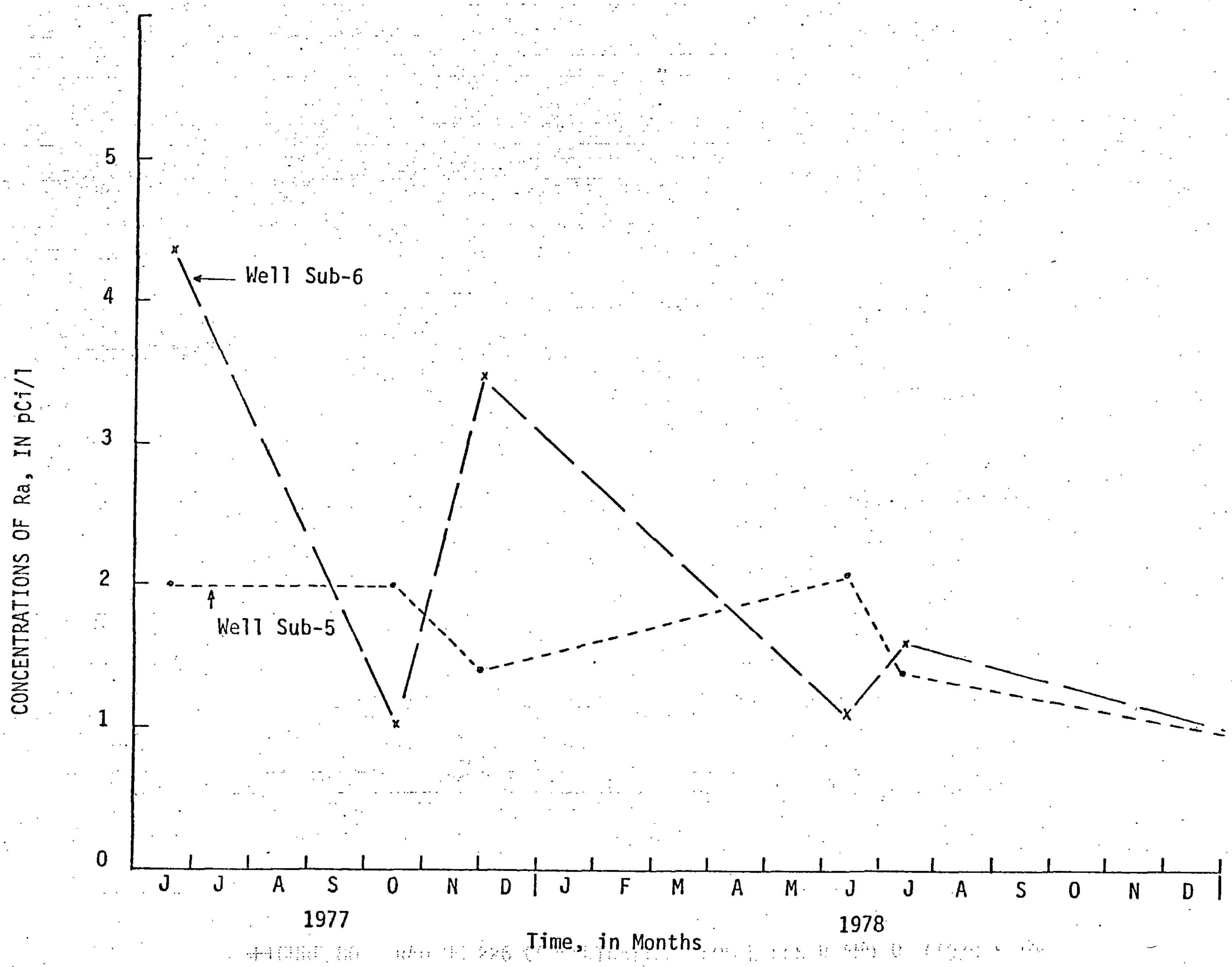


FIGURE 81. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1977 & 1978)

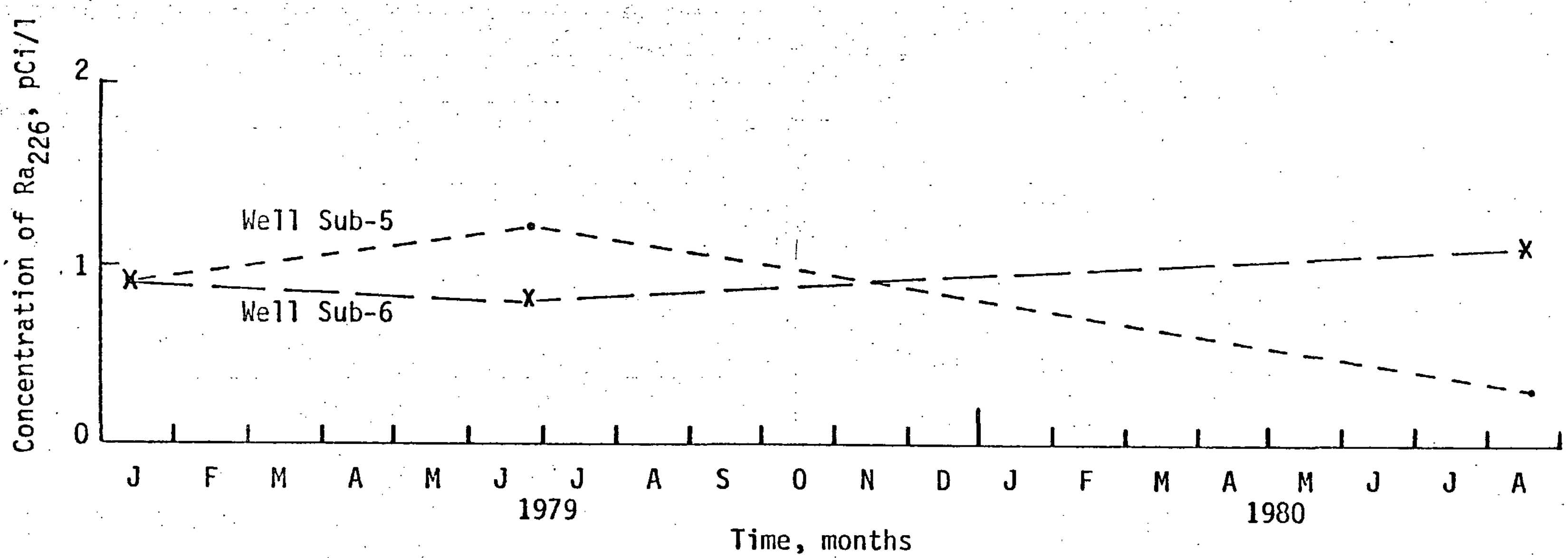


FIGURE 82. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-5 AND SUB-6 (1979 & 1980)

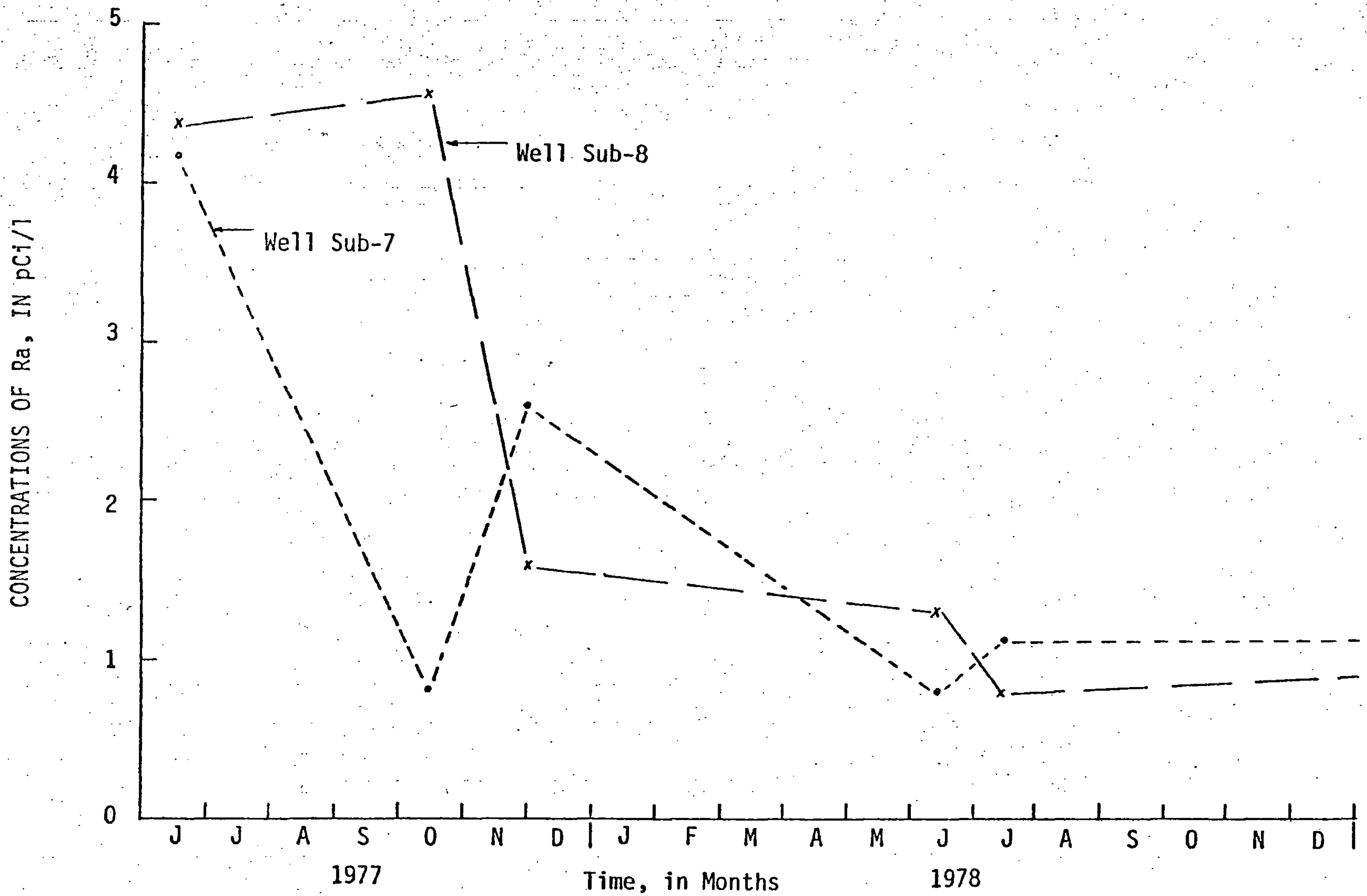


FIGURE 83. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8 (1977 & 1978)

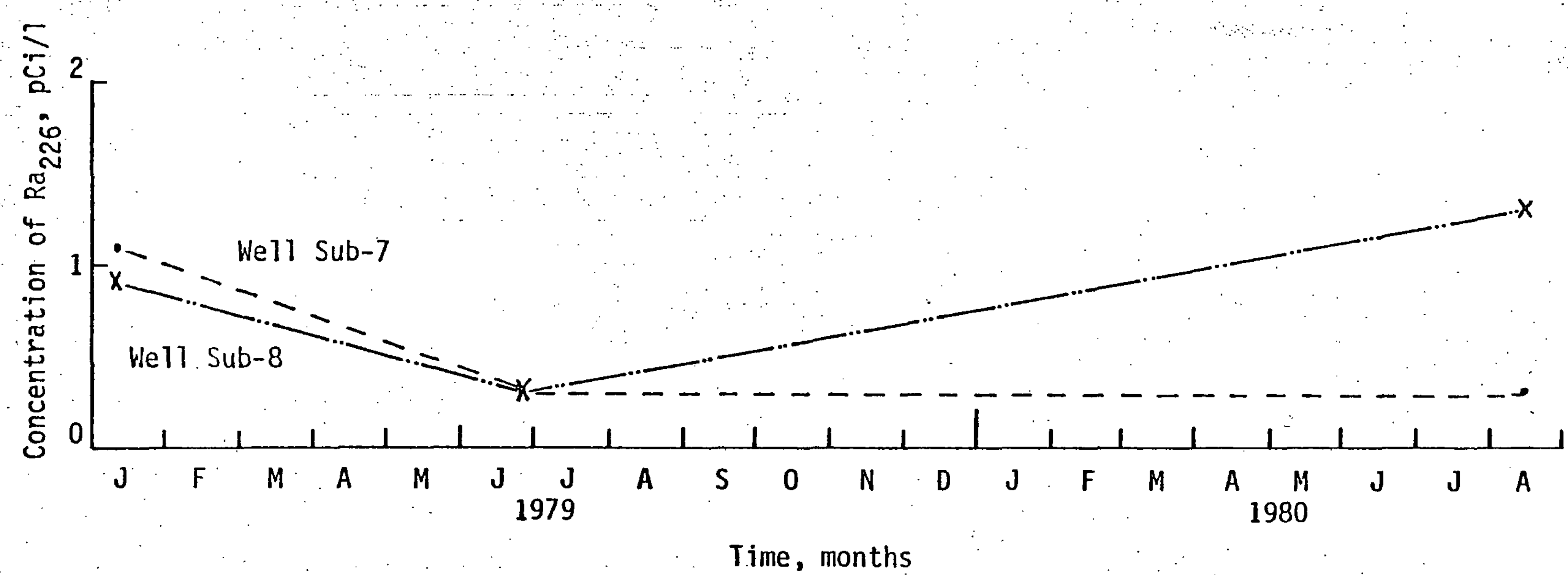


FIGURE 84. RADIUM 226 CONCENTRATIONS FOR WELLS SUB-7 AND SUB-8 (1979 & 1980)

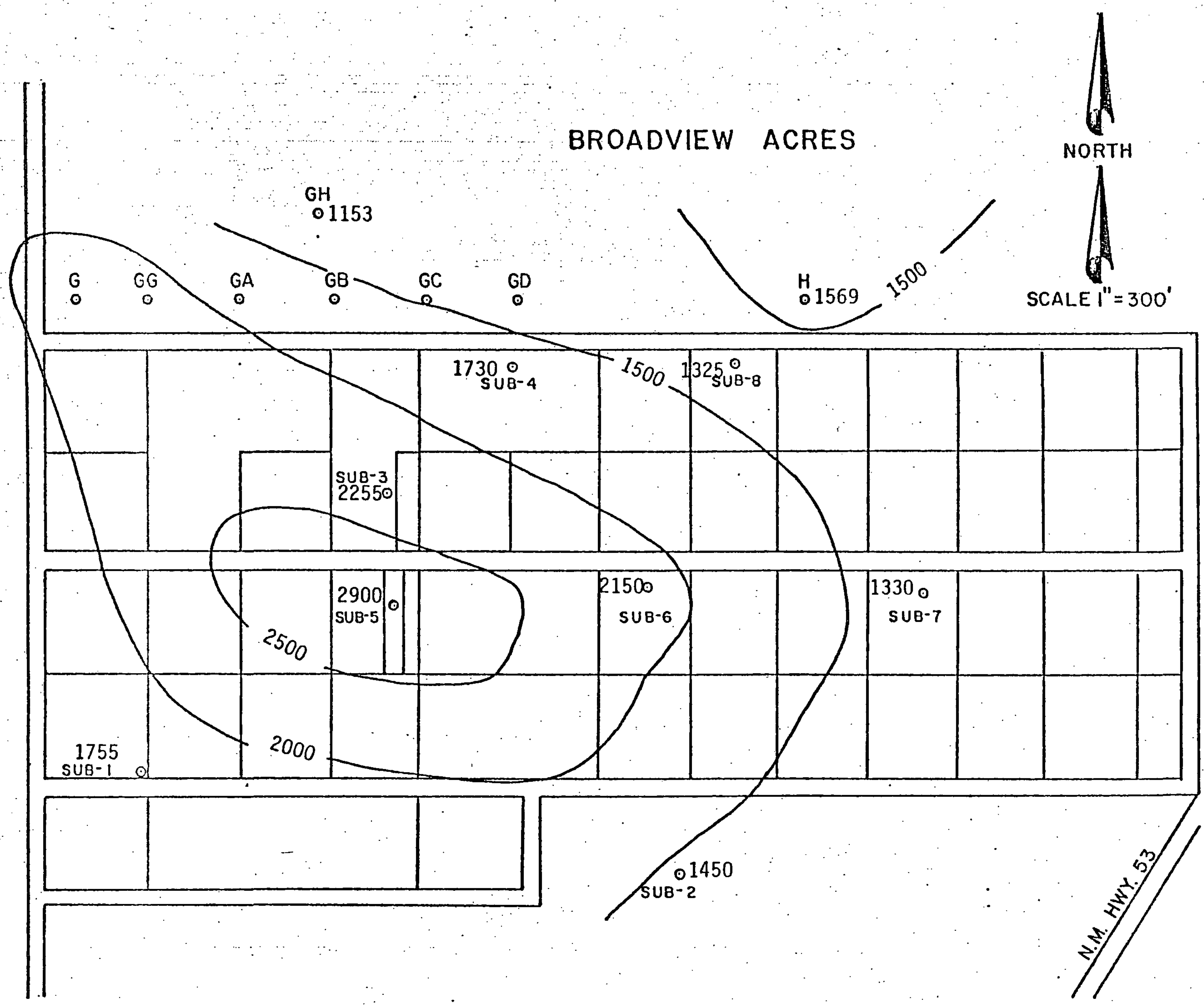


FIGURE 85. SULFATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l

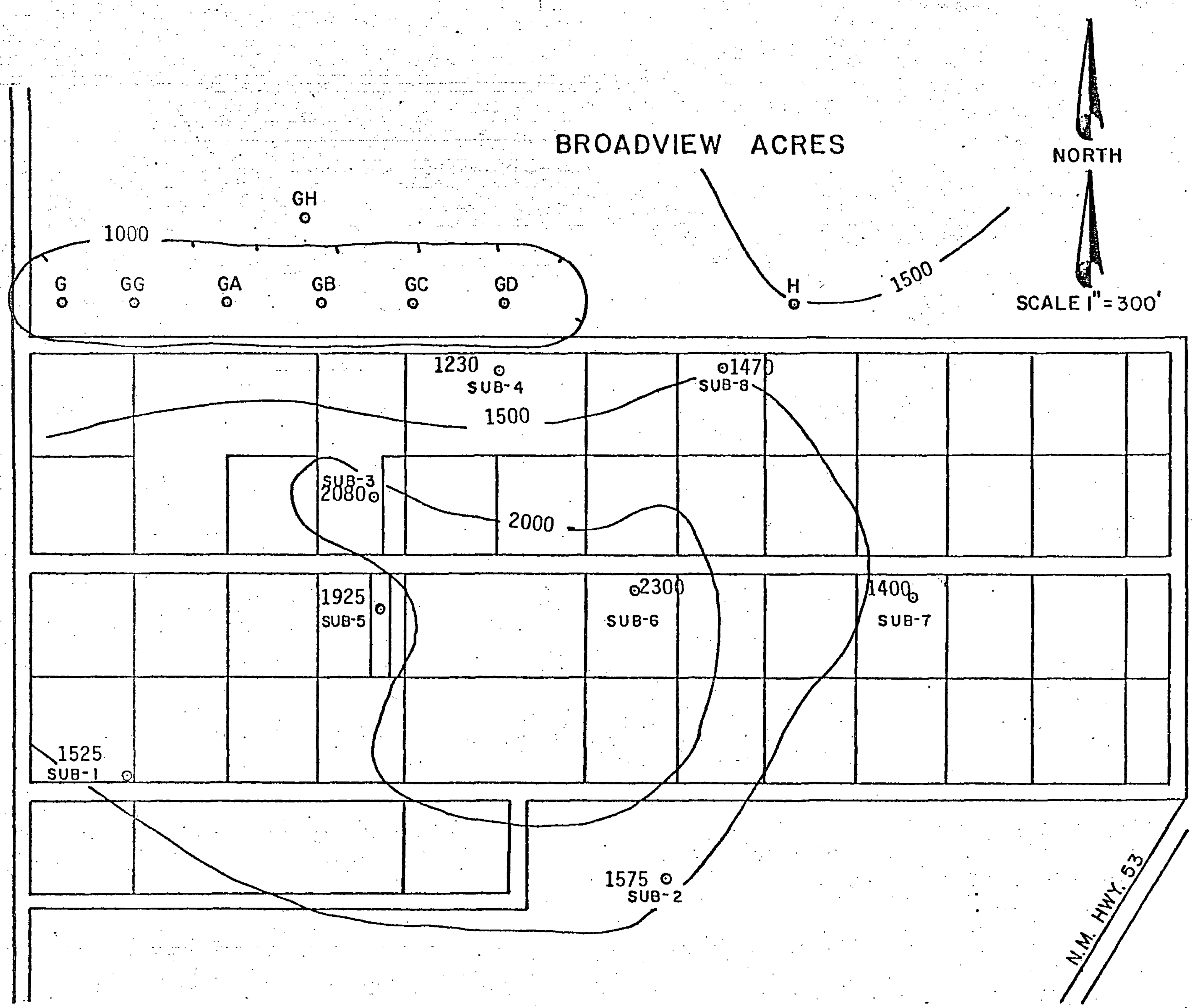


FIGURE 86. SULFATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 11/30/77 IN mg/l

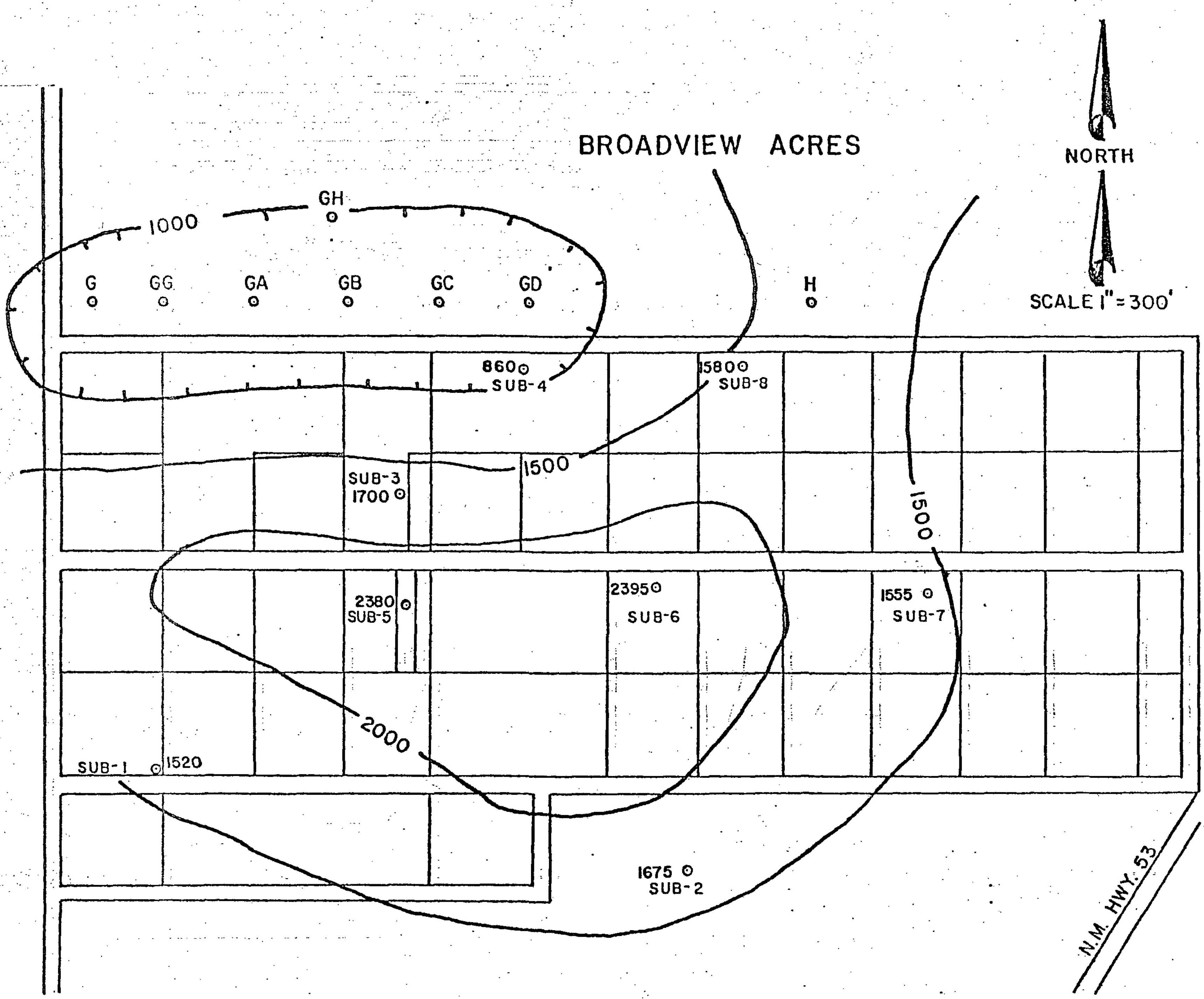


FIGURE 87. SULFATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN mg/l

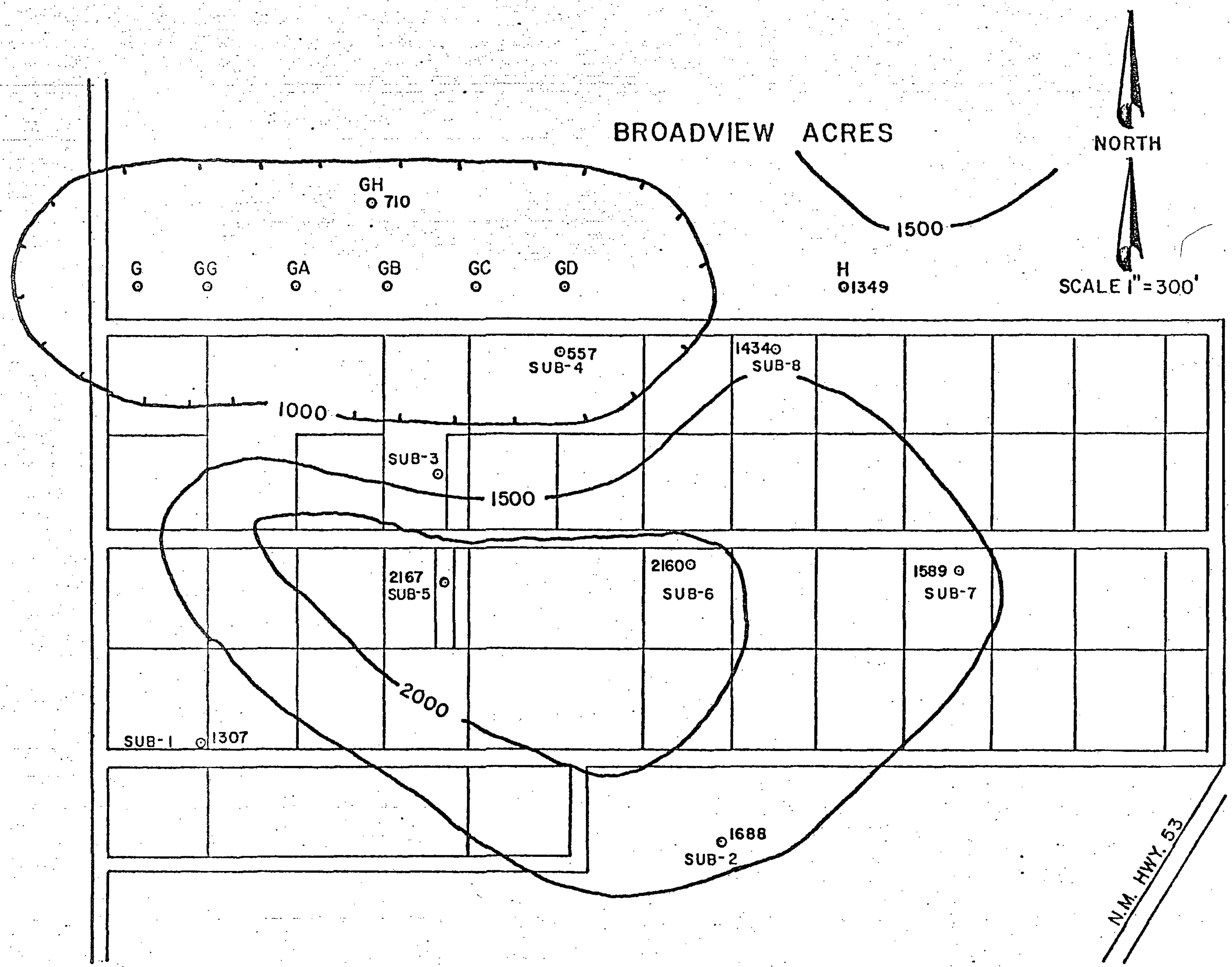


FIGURE 88. SULFATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN mg/l

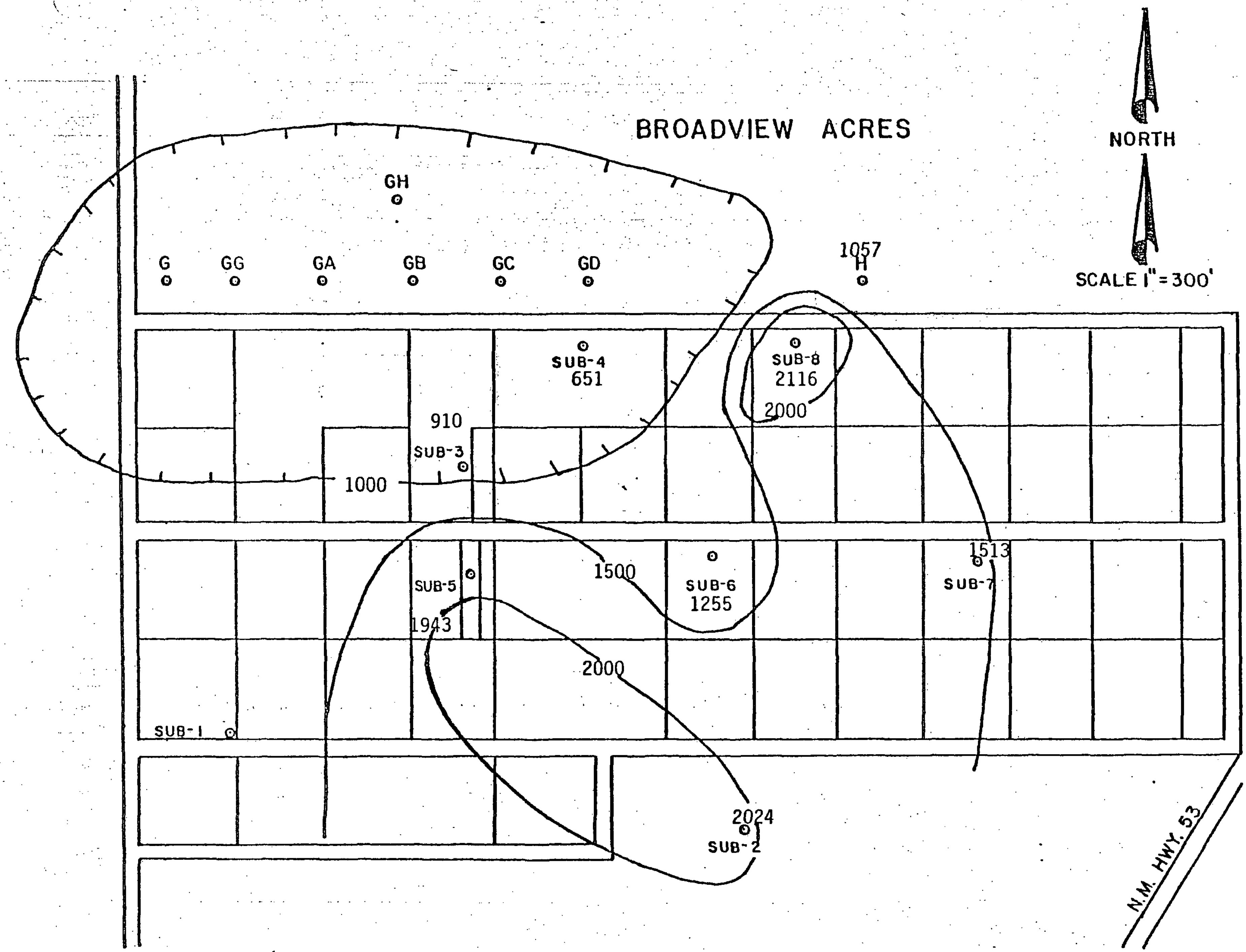


FIGURE 89. SULFATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

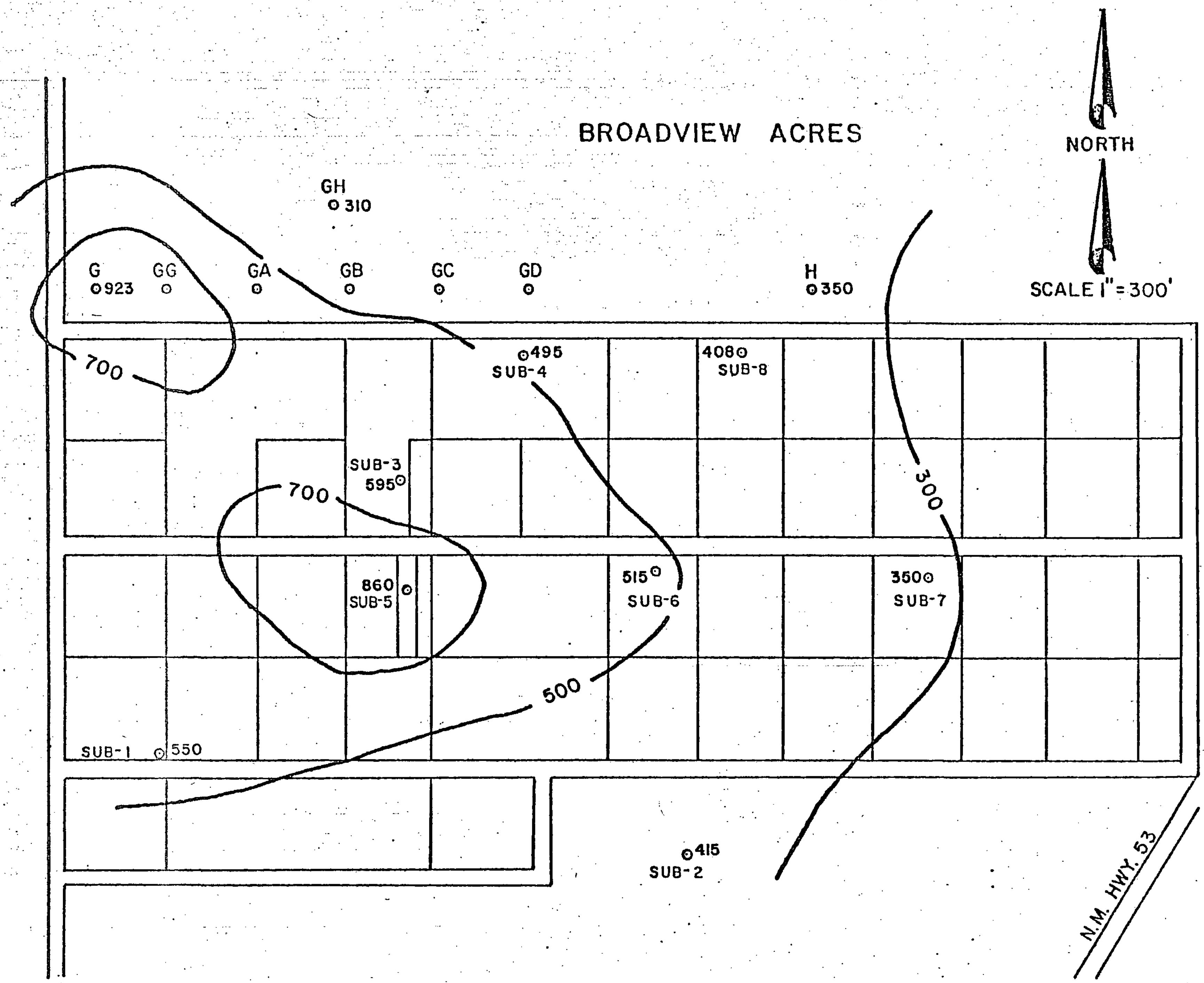


FIGURE 90. SODIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l

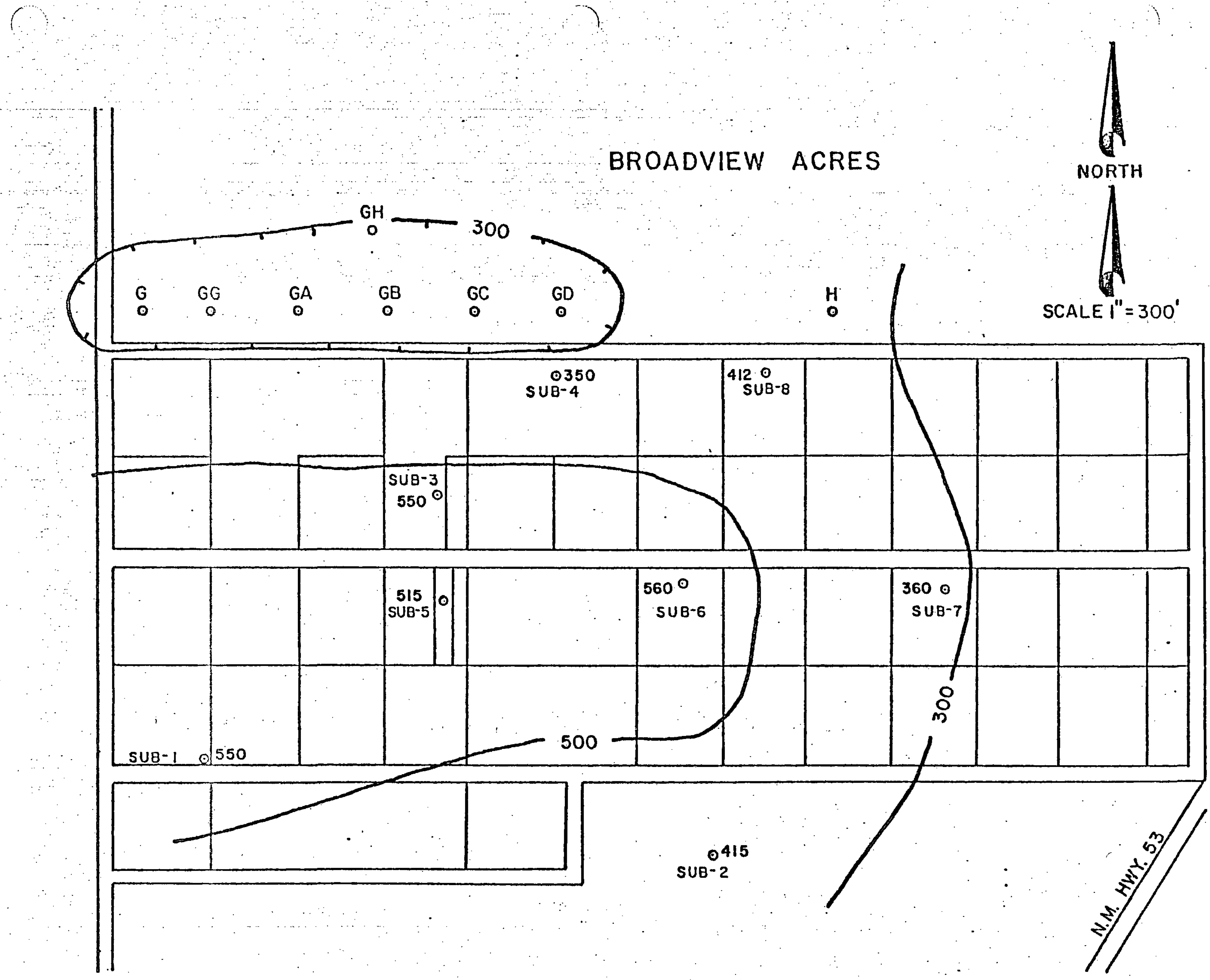


FIGURE 91. SODIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 11/13/77, IN mg/l

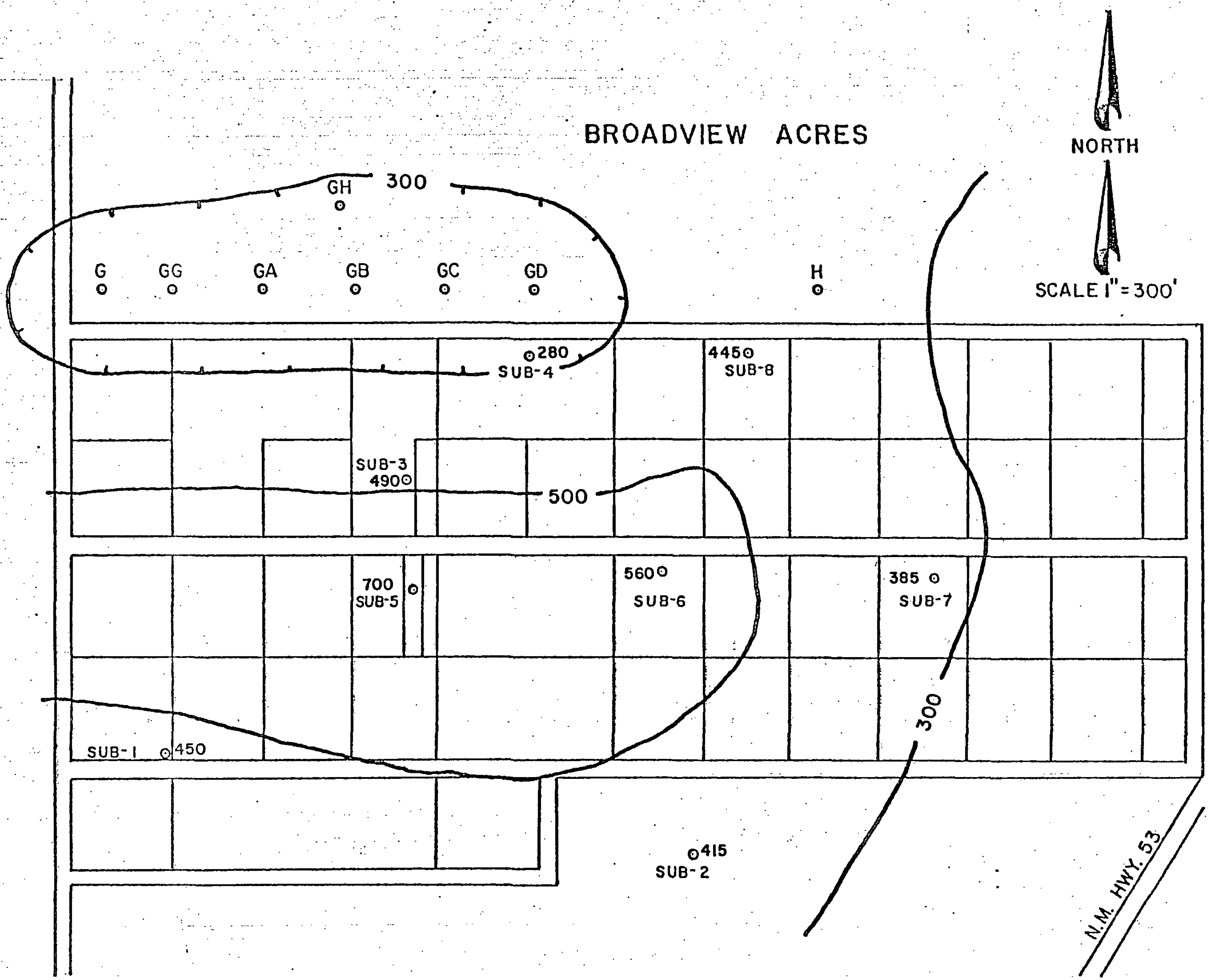


FIGURE 92. SODIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN mg/l

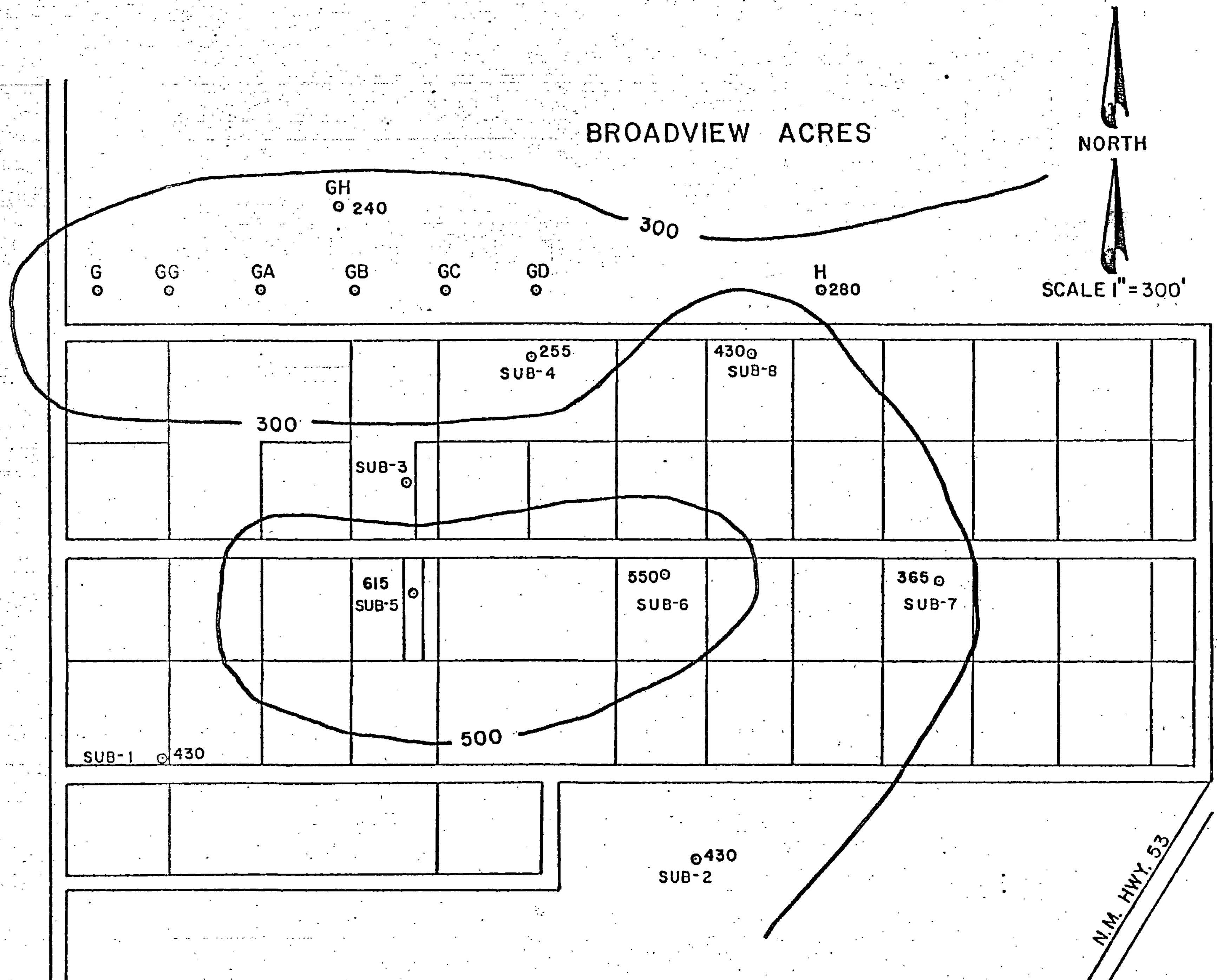


FIGURE 93. SODIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN mg/l

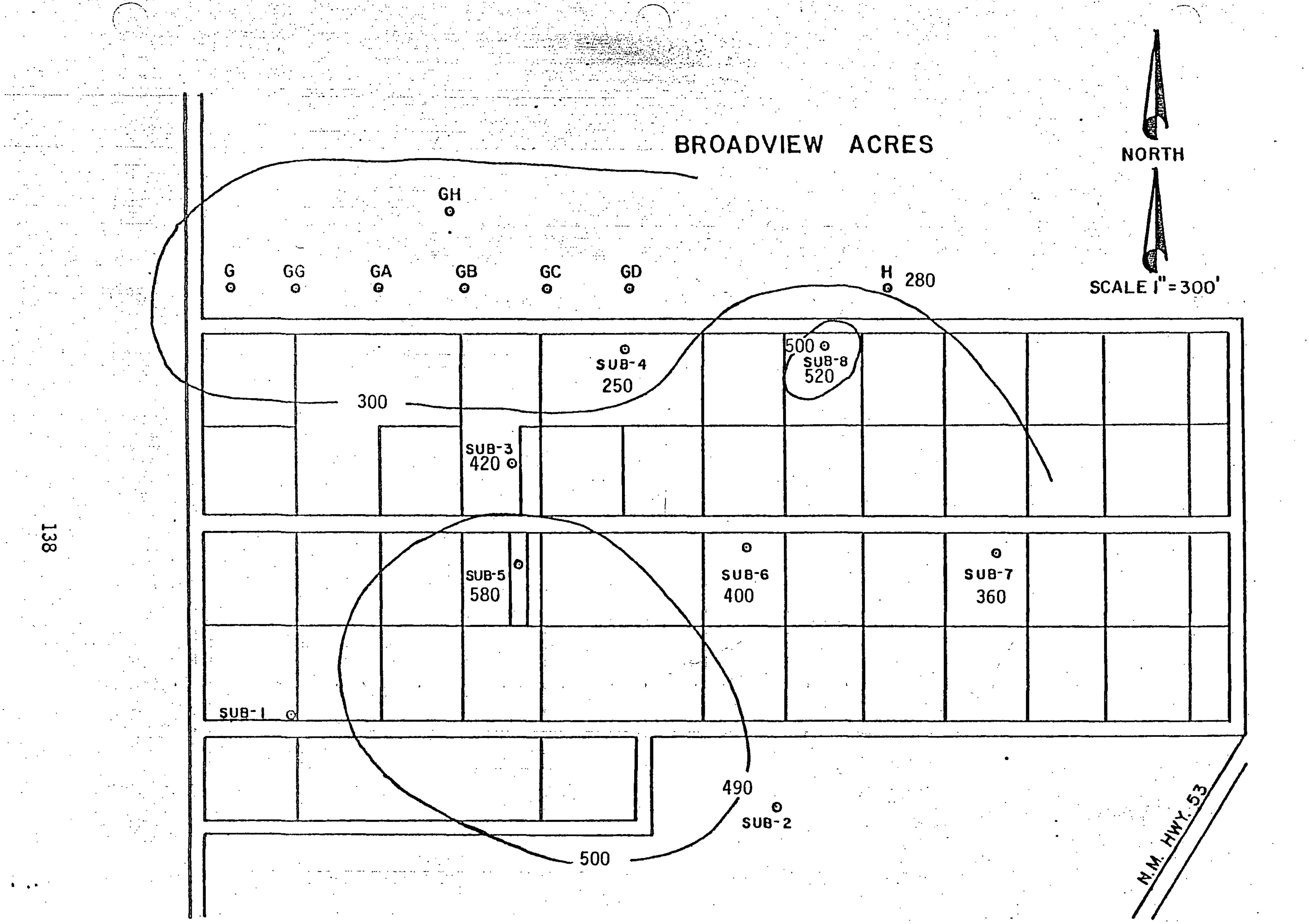


FIGURE 94. SODIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

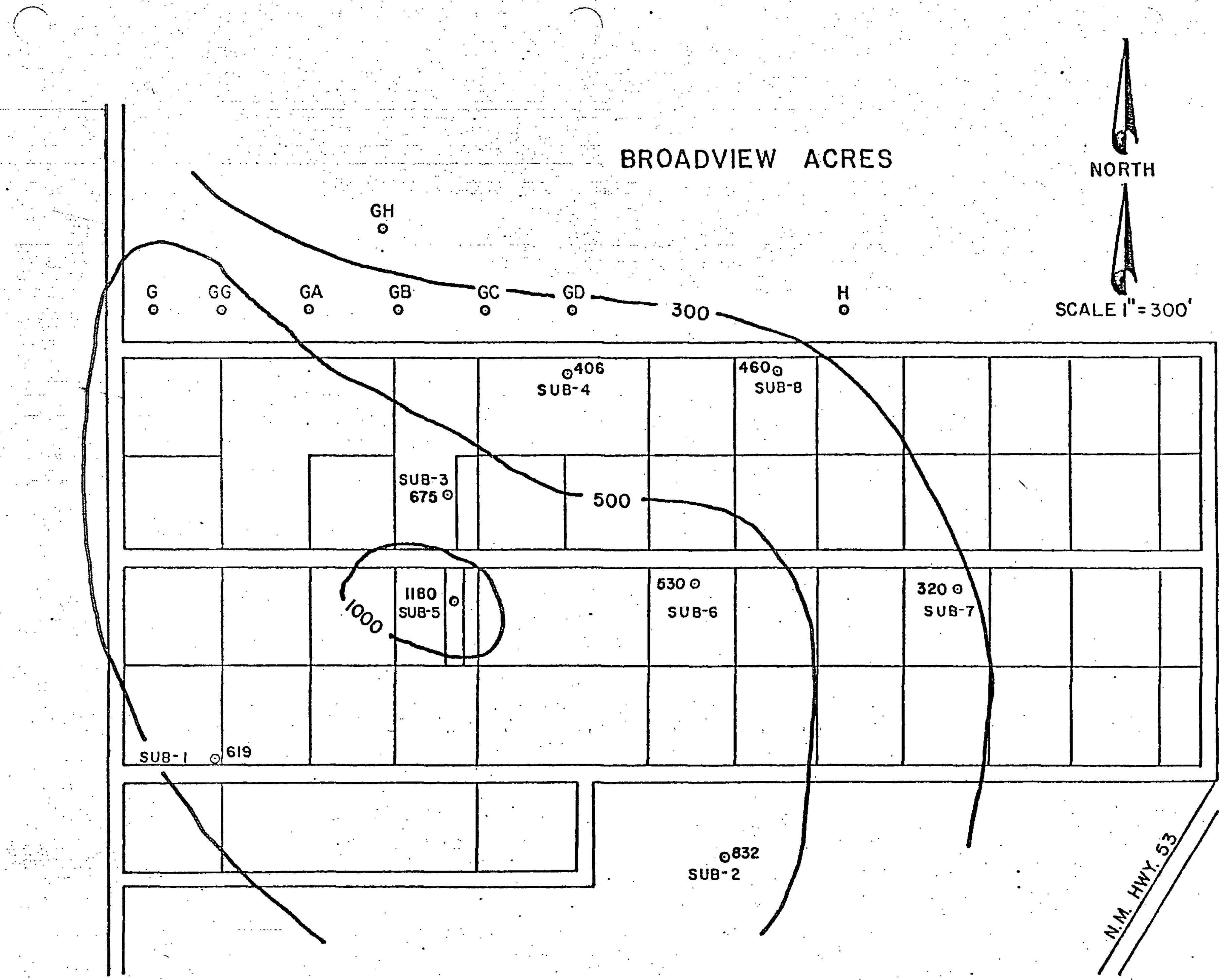
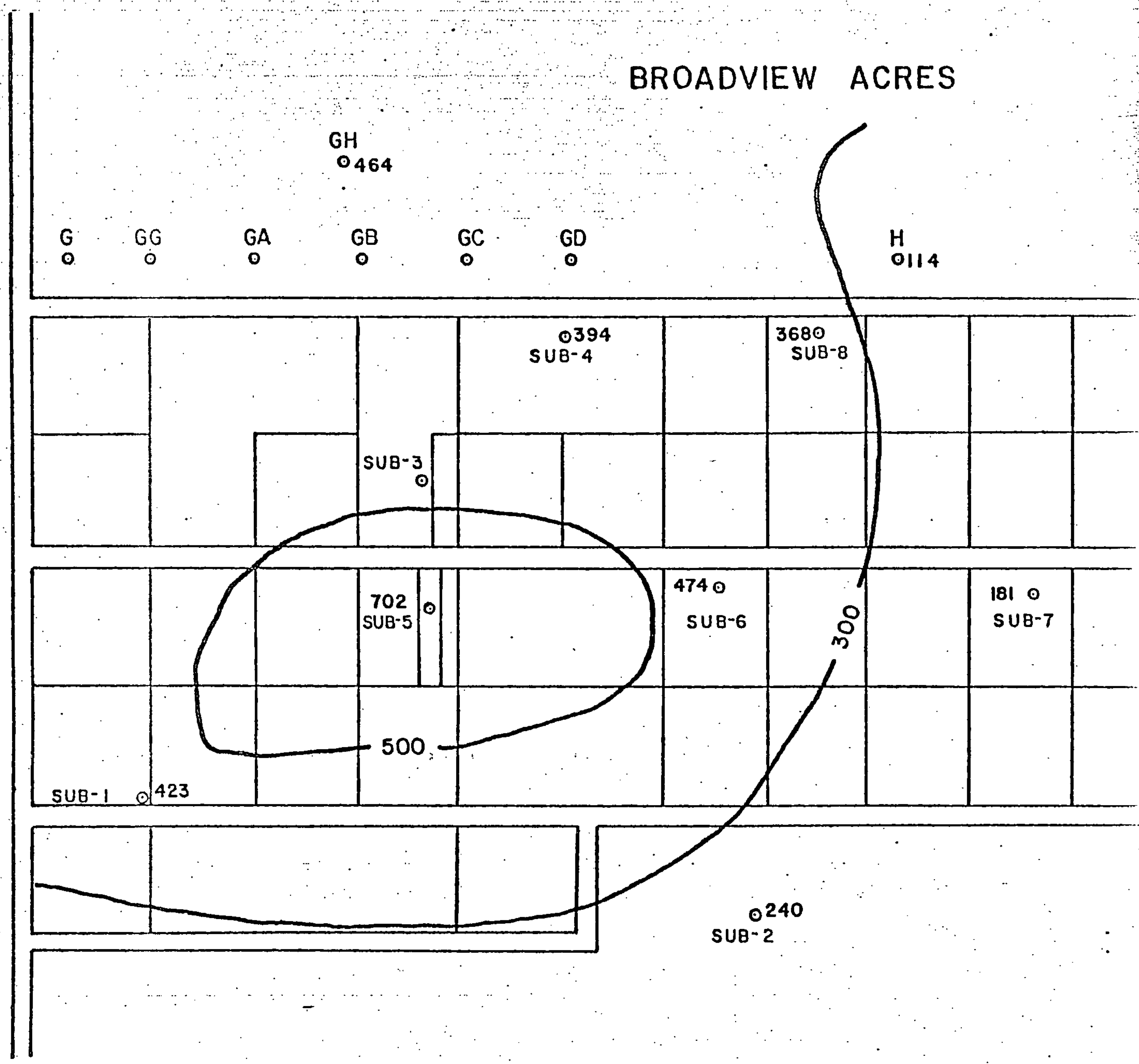


FIGURE 95. BICARBONATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l


BROADVIEW ACRES
GH
464
G
GG
GA
GB
GC
GD
H
114
394
SUB-4
368
SUB-8
SUB-3
702
SUB-5
474
SUB-6
181
SUB-7
300
500
SUB-1
423
240
SUB-2

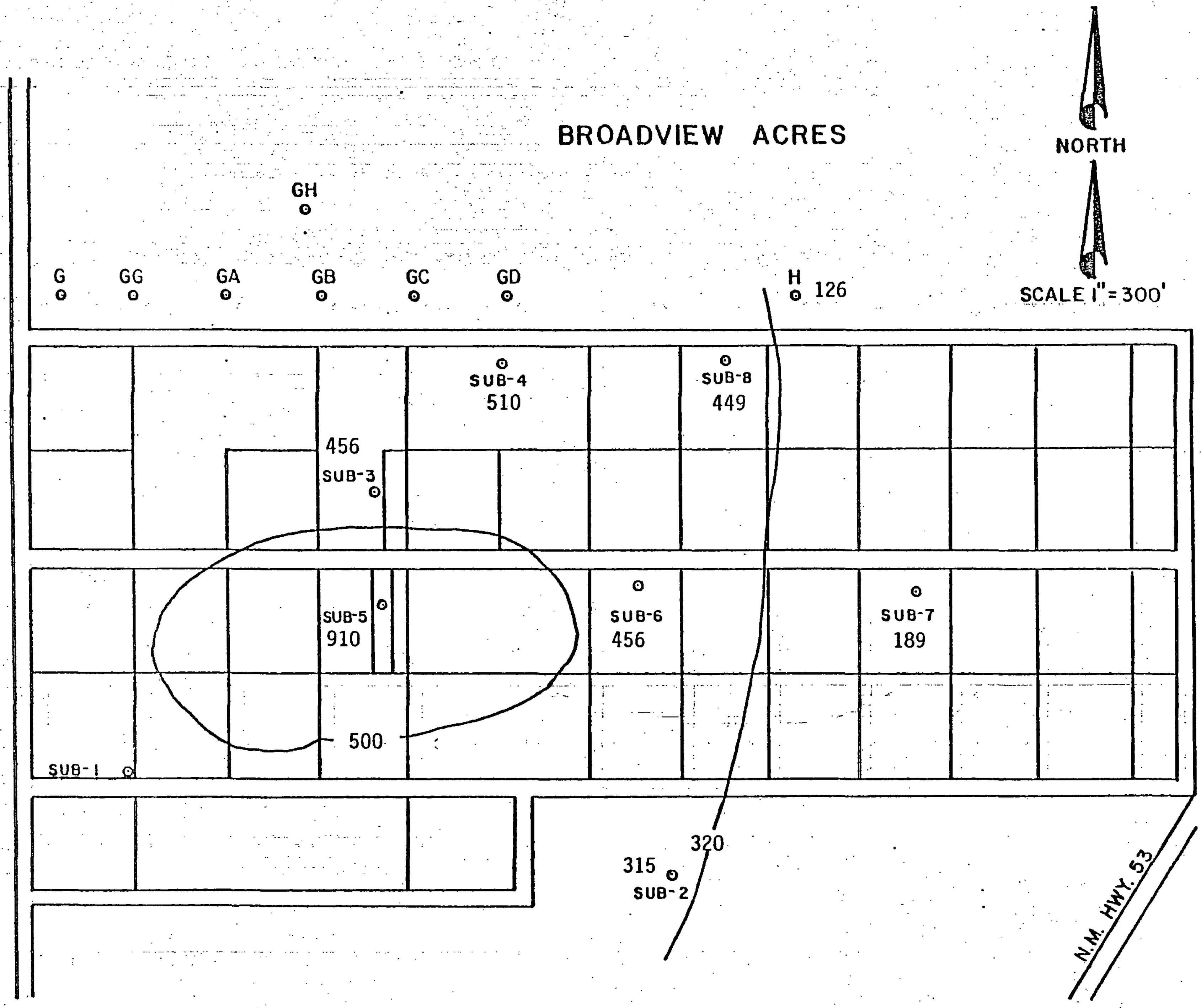
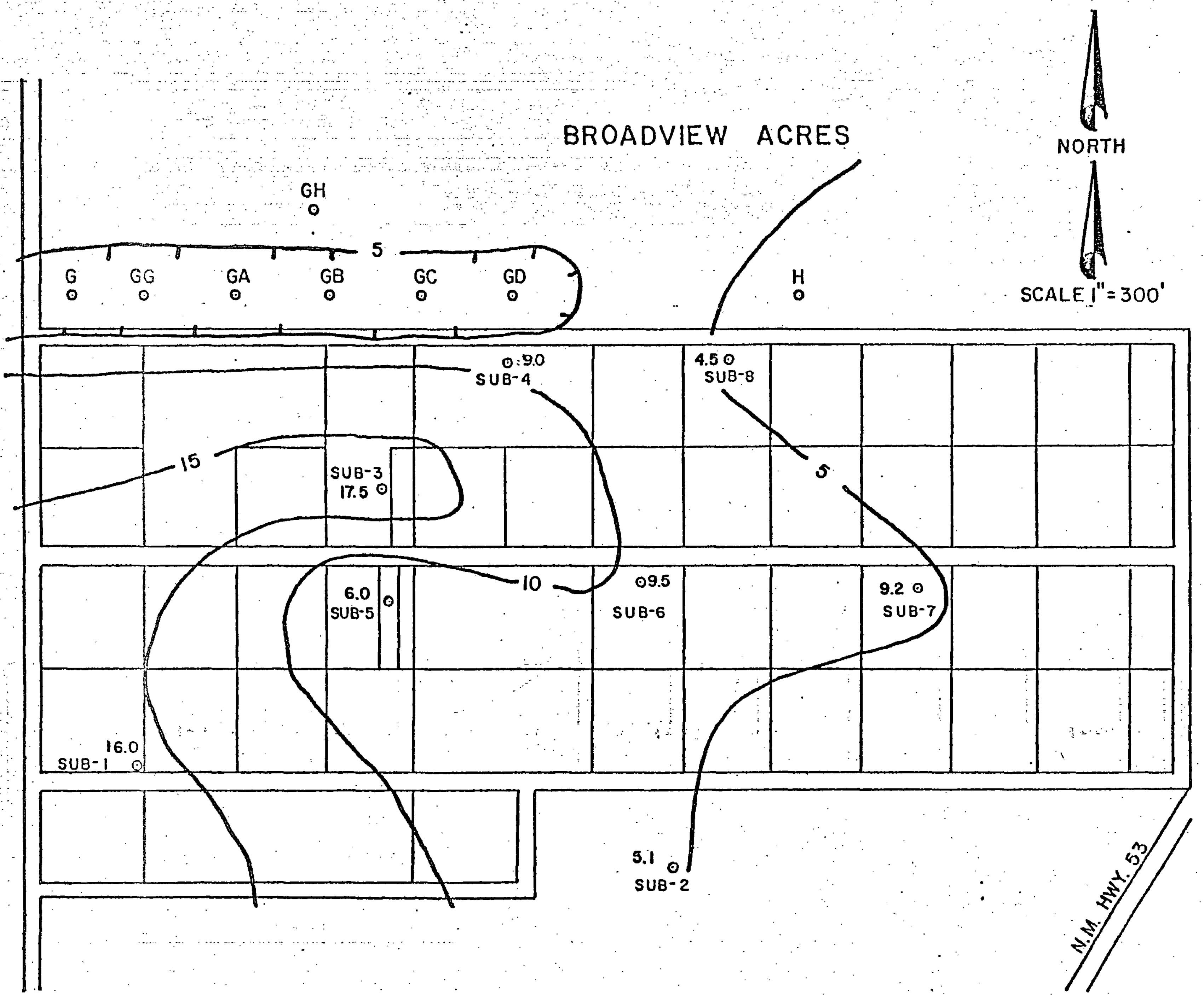


FIGURE 97. BICARBONATE CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l


BROADVIEW ACRES
NORTH
SCALE 1" = 300'
GH
G
GG
GA
GB
GC
GD
H
5
15
10
5
9.0
SUB-4
4.5
SUB-8
SUB-3
17.5
6.0
SUB-5
9.5
SUB-6
9.2
SUB-7
16.0
SUB-1
5.1
SUB-2
N.M. HWY. 53

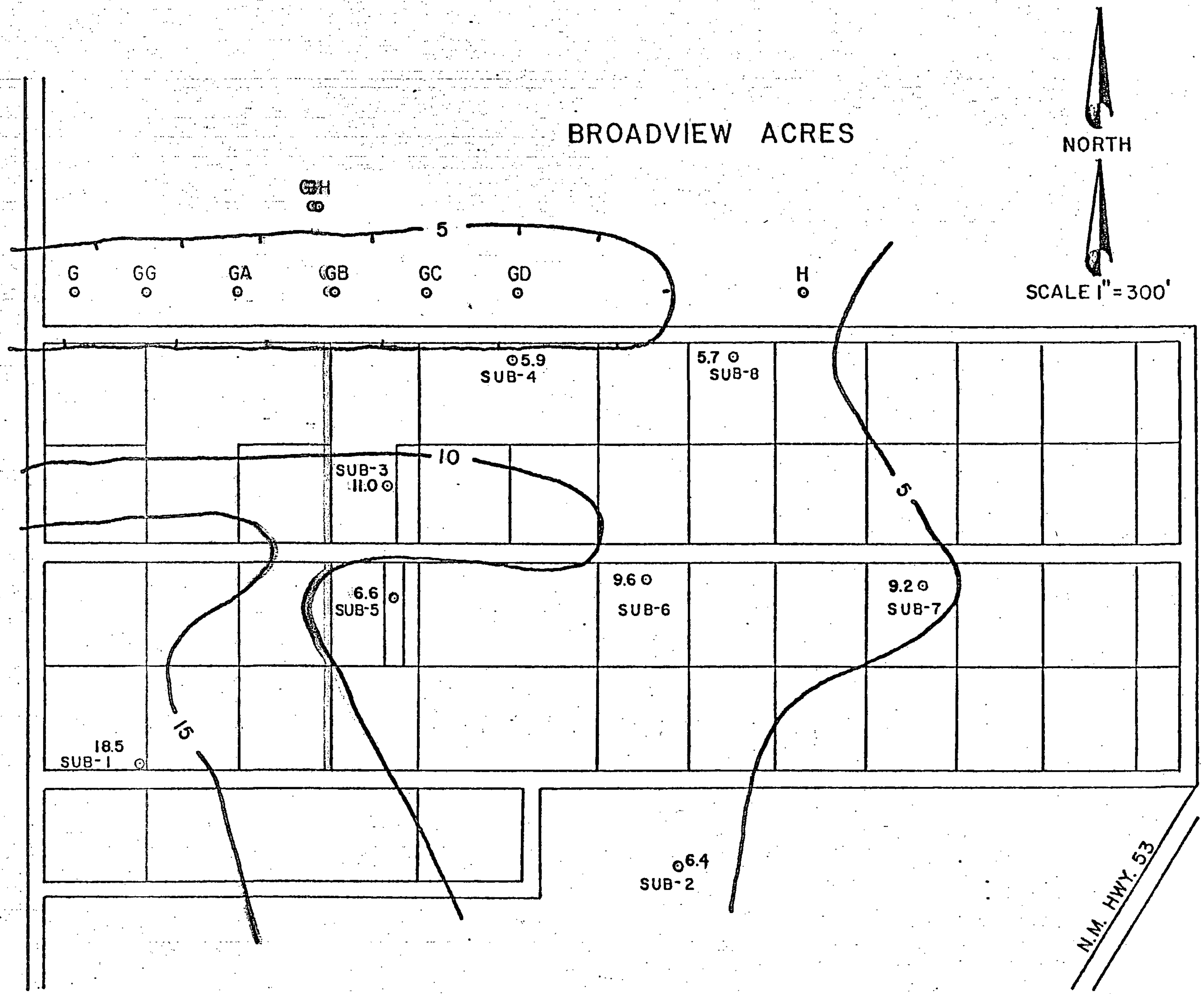


FIGURE 99. NITRATE CONCENTRATIONS AS N FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN mg/l

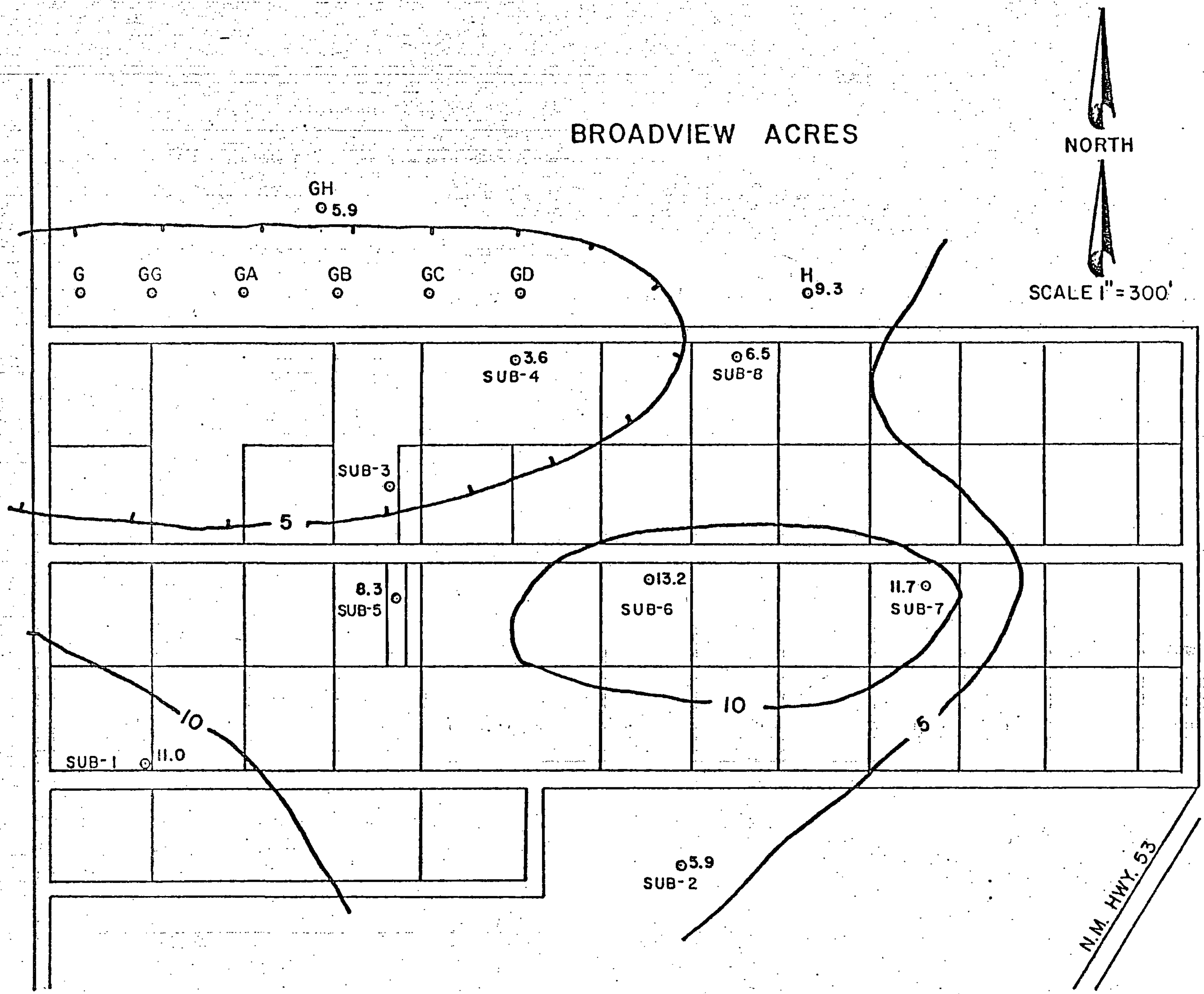


FIGURE 100. NITRATE CONCENTRATION FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, AS N, IN mg/l

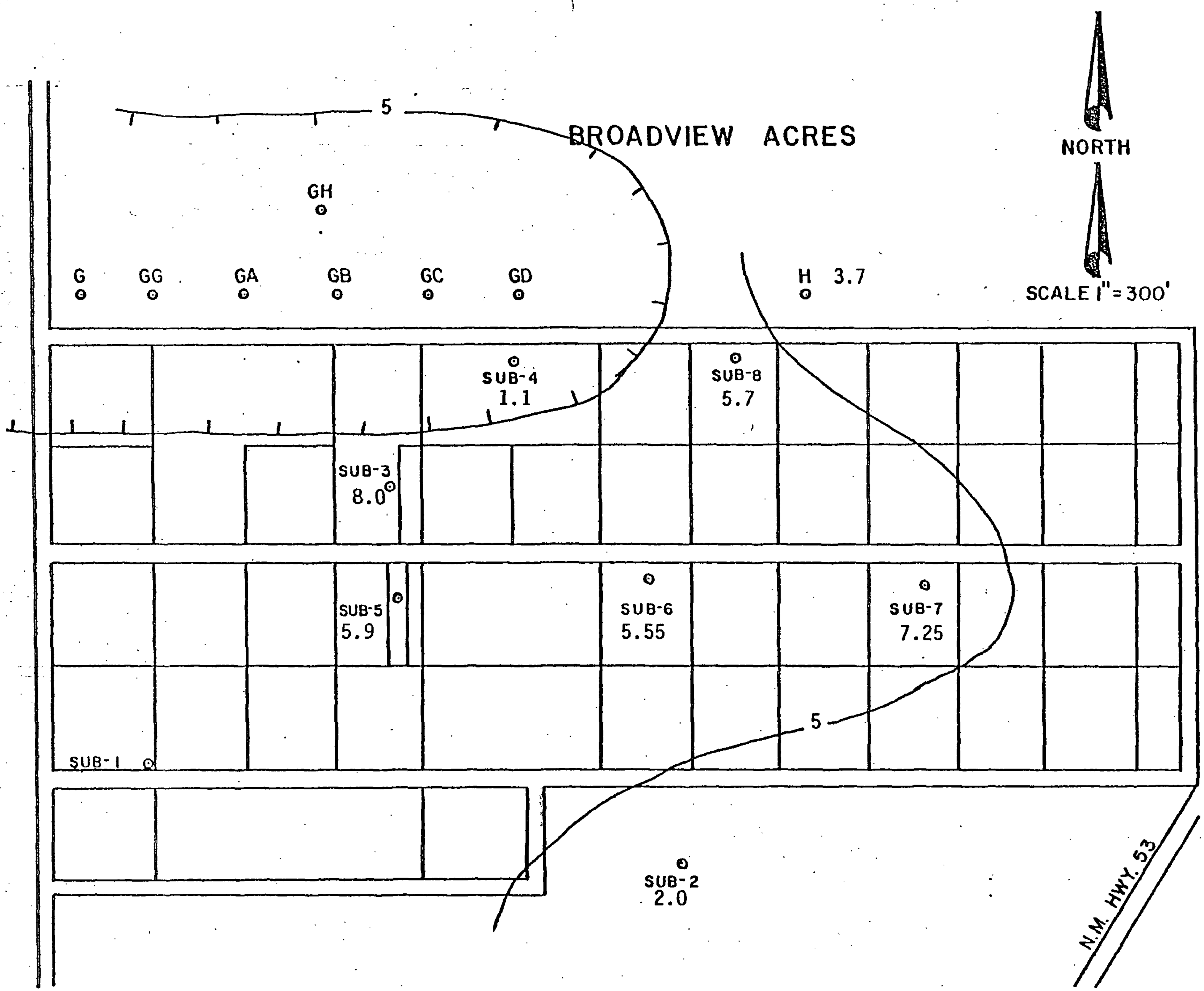


FIGURE 101. NITRATE CONCENTRATION, AS N, FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

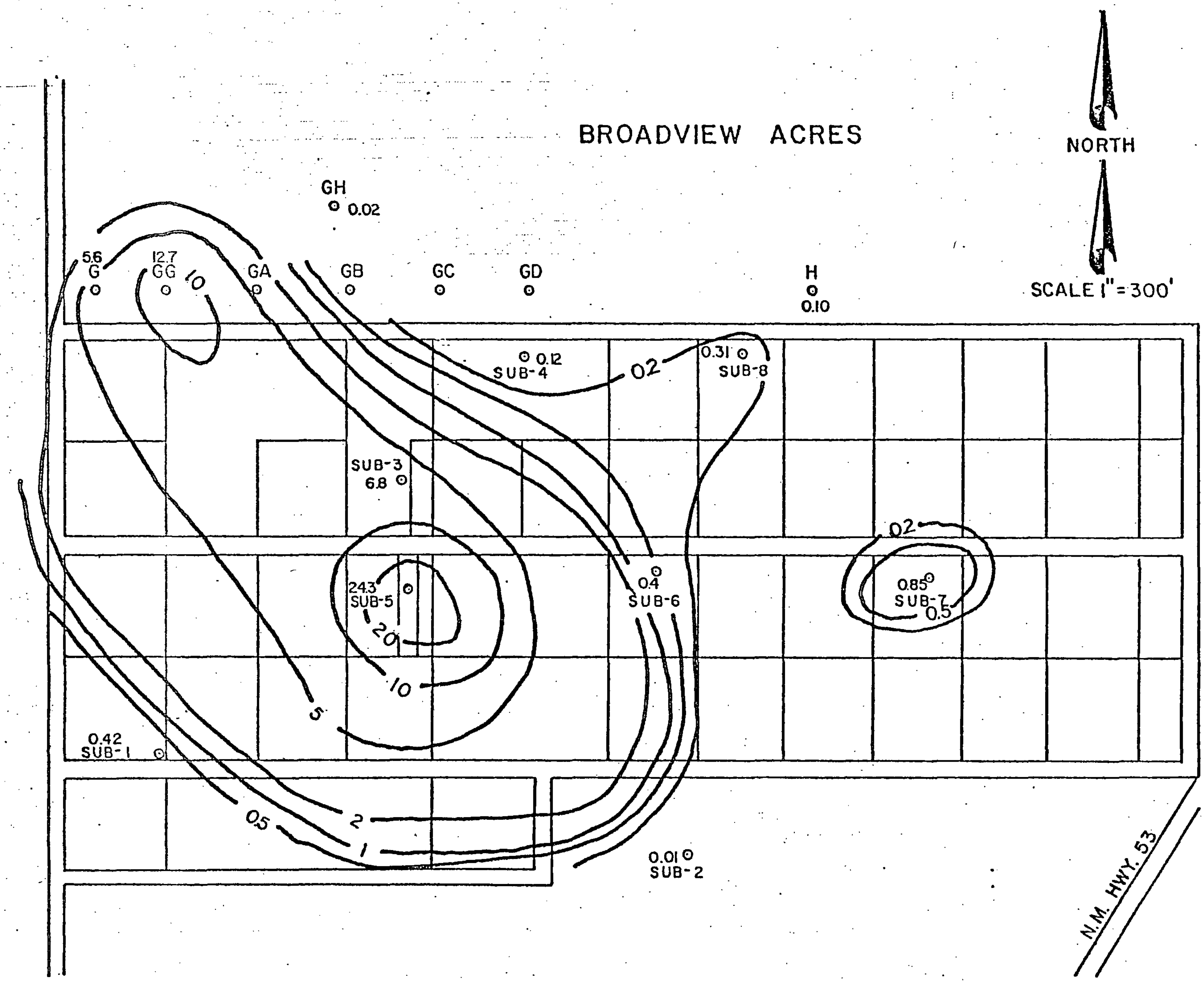


FIGURE 102. URANIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l

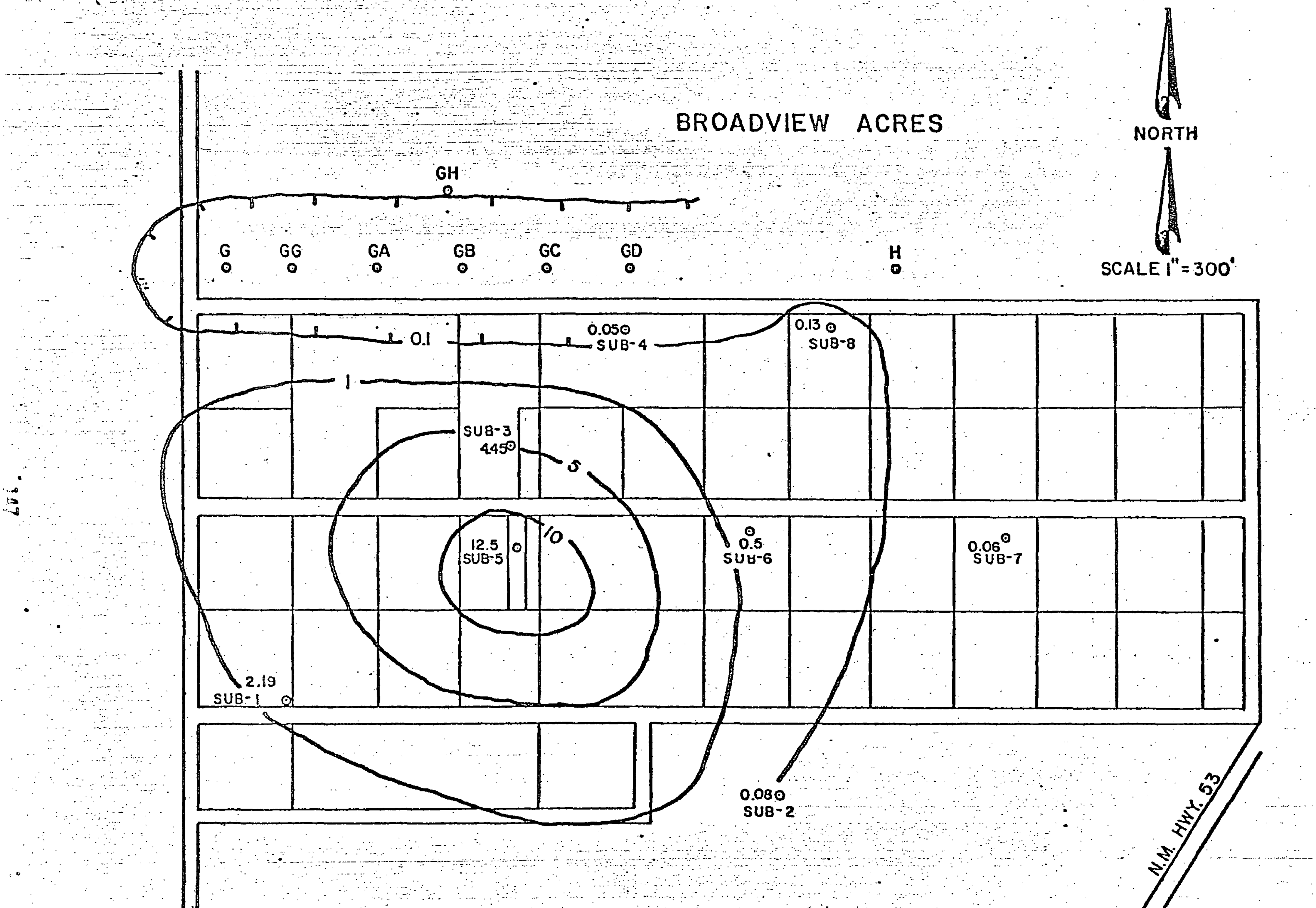


FIGURE 103. URANIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 11/30/77, IN mg/l

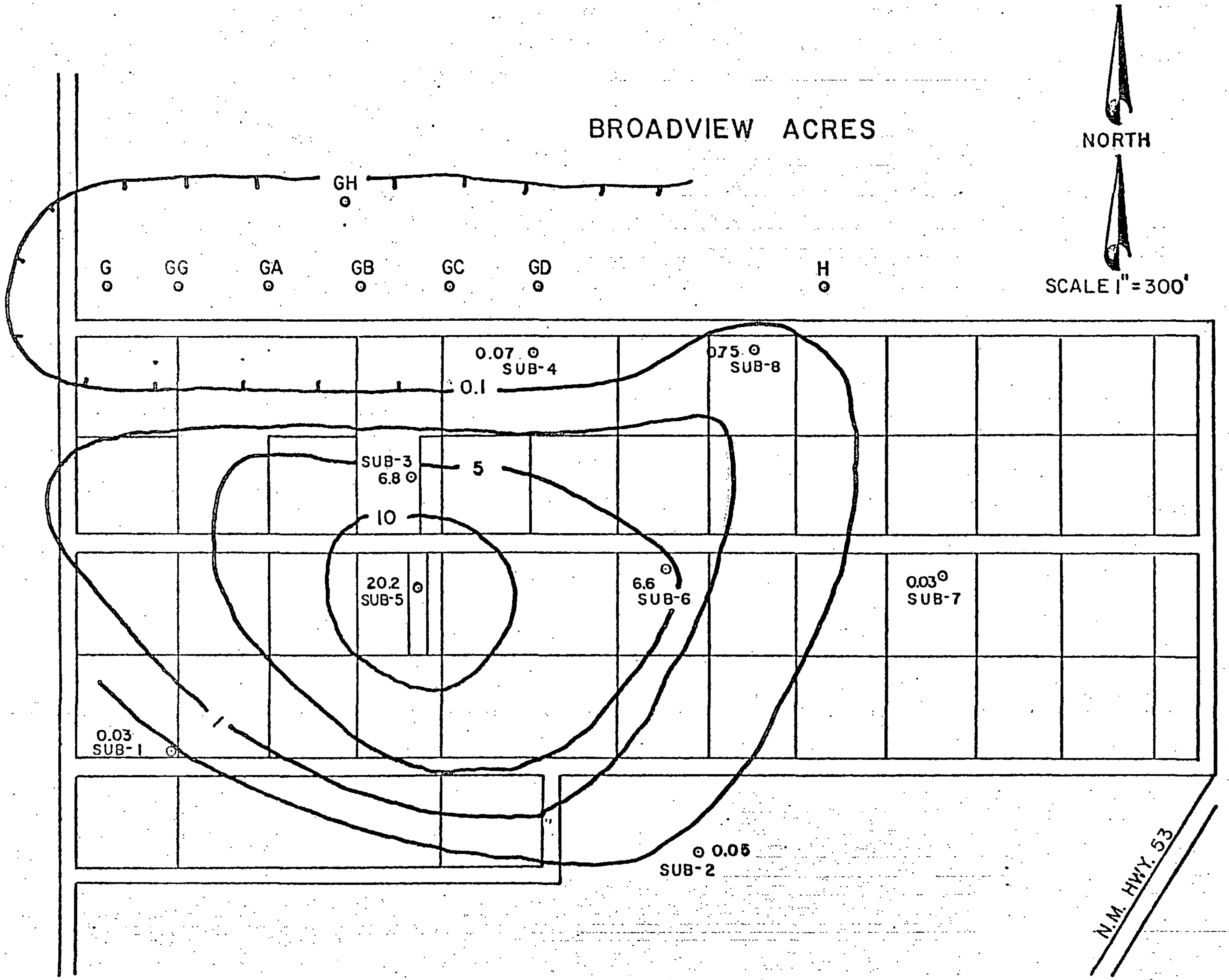


FIGURE 104. URANIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN mg/l

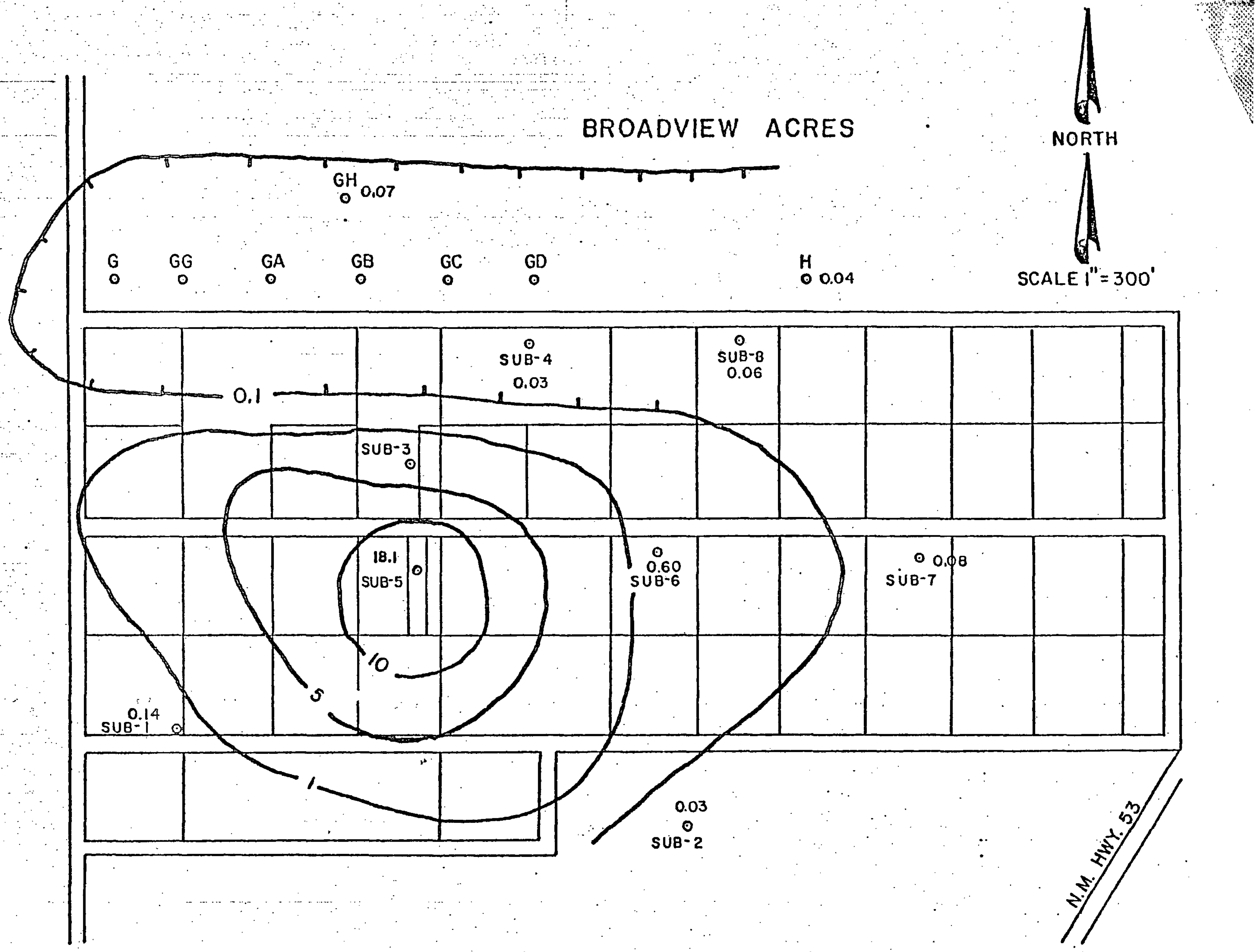


FIGURE 105. URANIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN mg/l

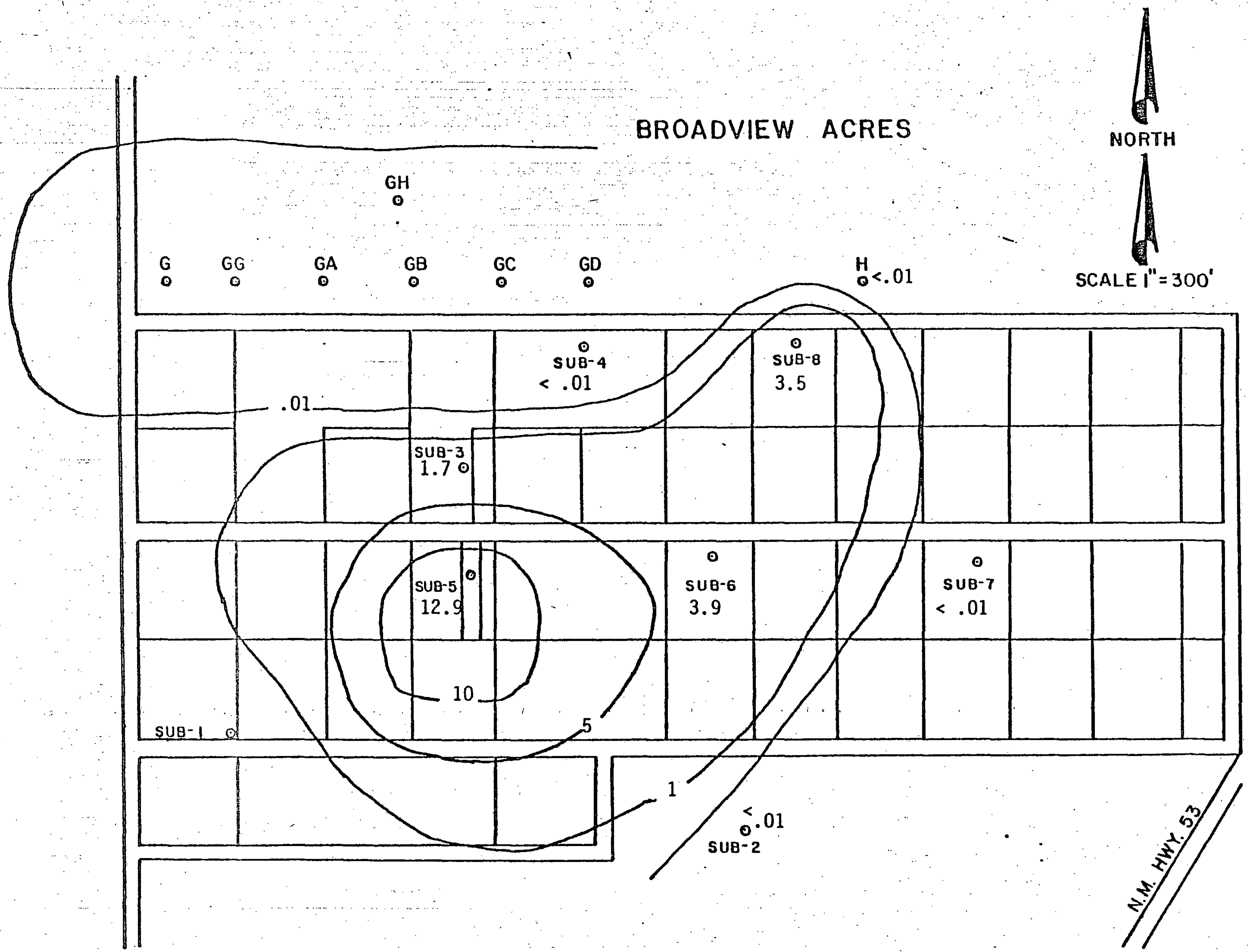


FIGURE 106. URANIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

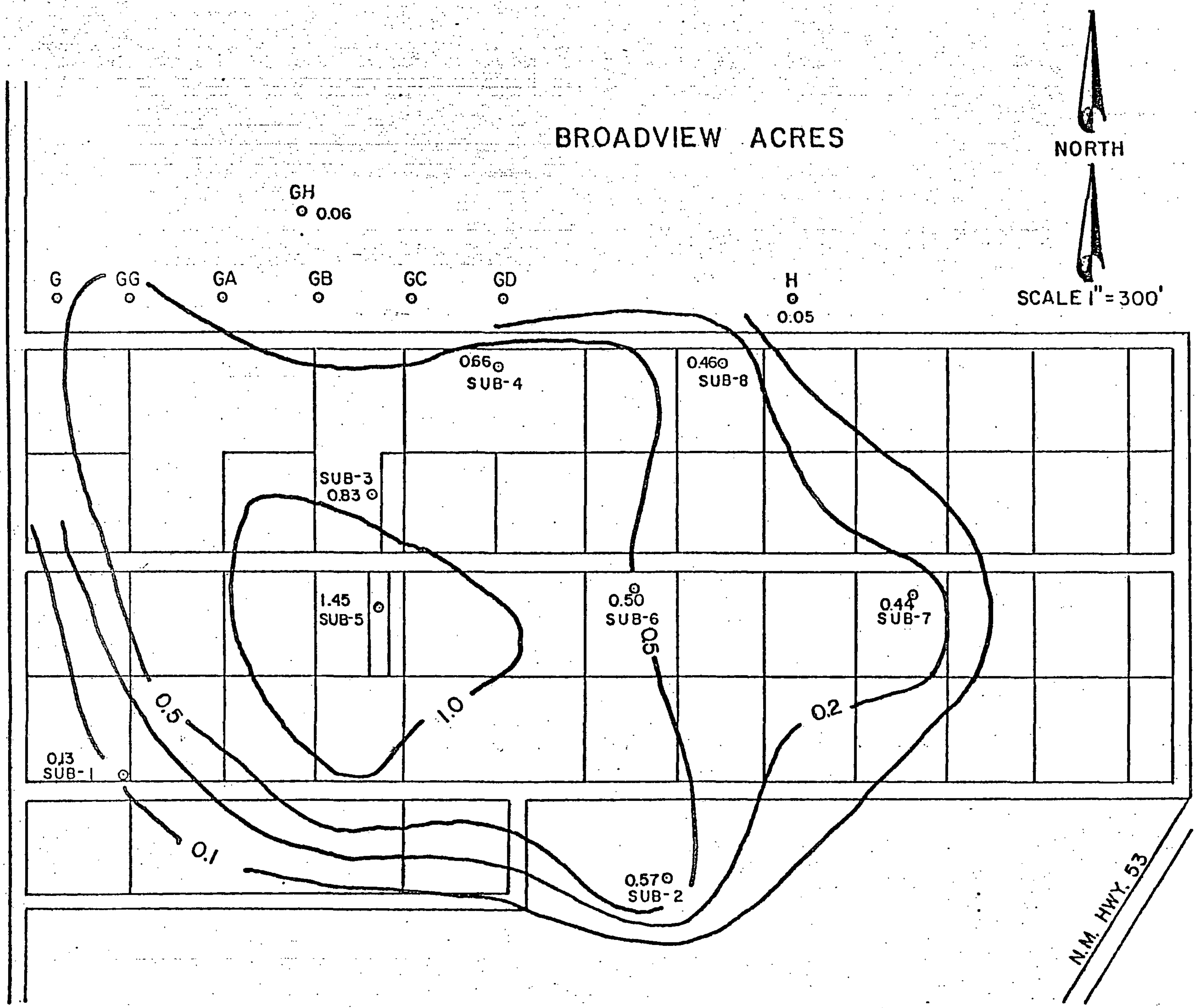


FIGURE 107. SELENIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l

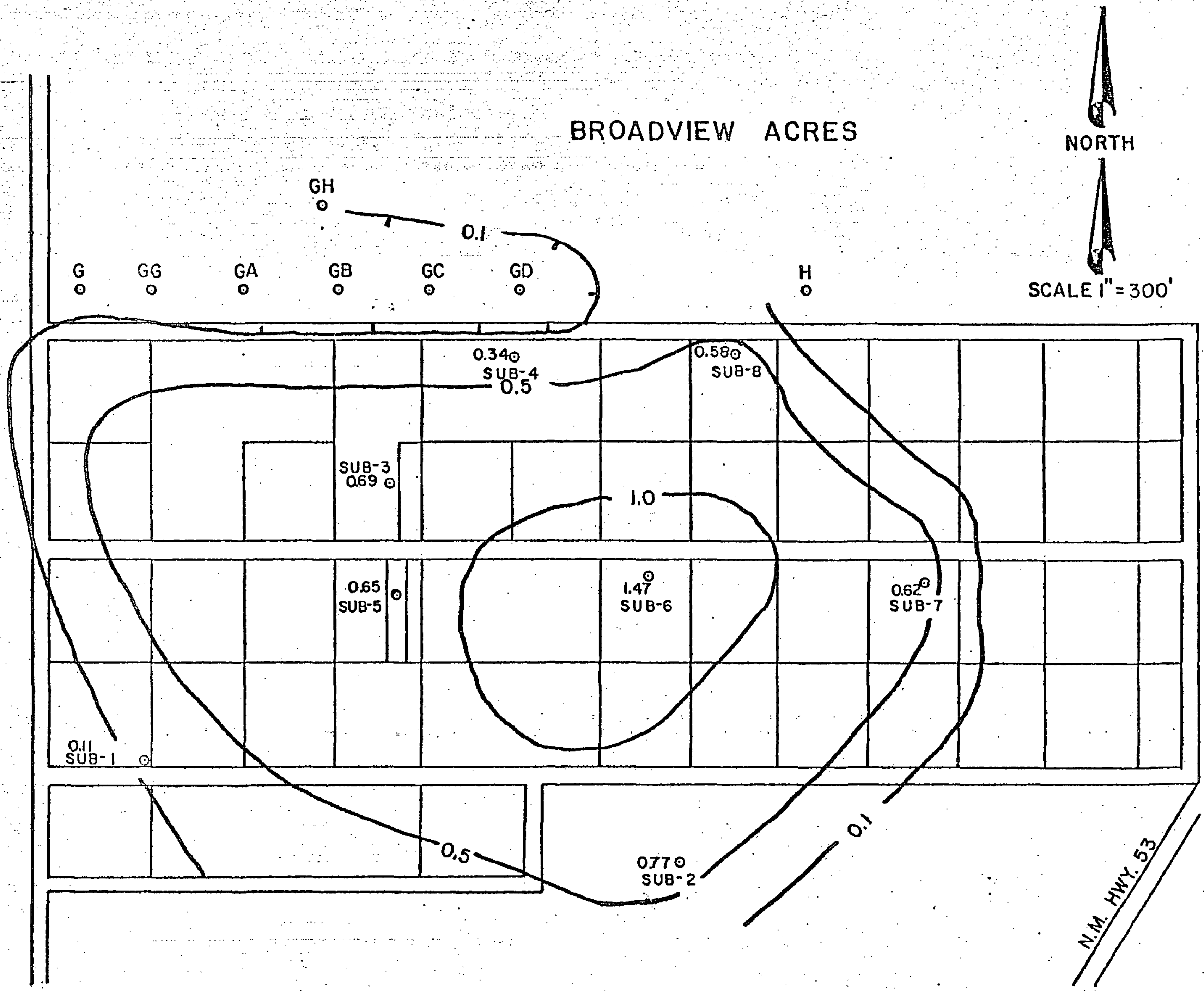


FIGURE 108. SELENIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 11/30/77, IN mg/l

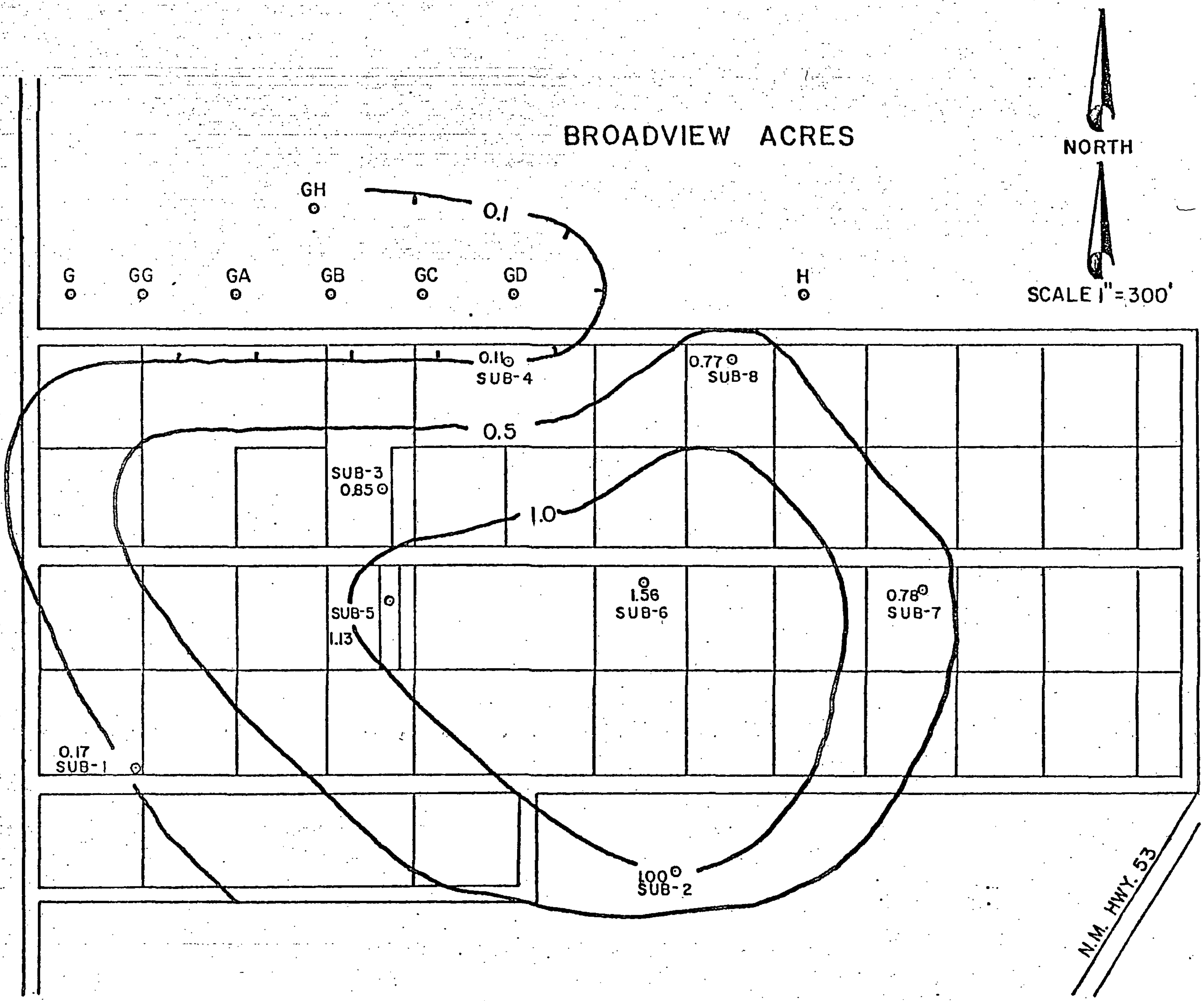


FIGURE 109. SELENIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN mg/l

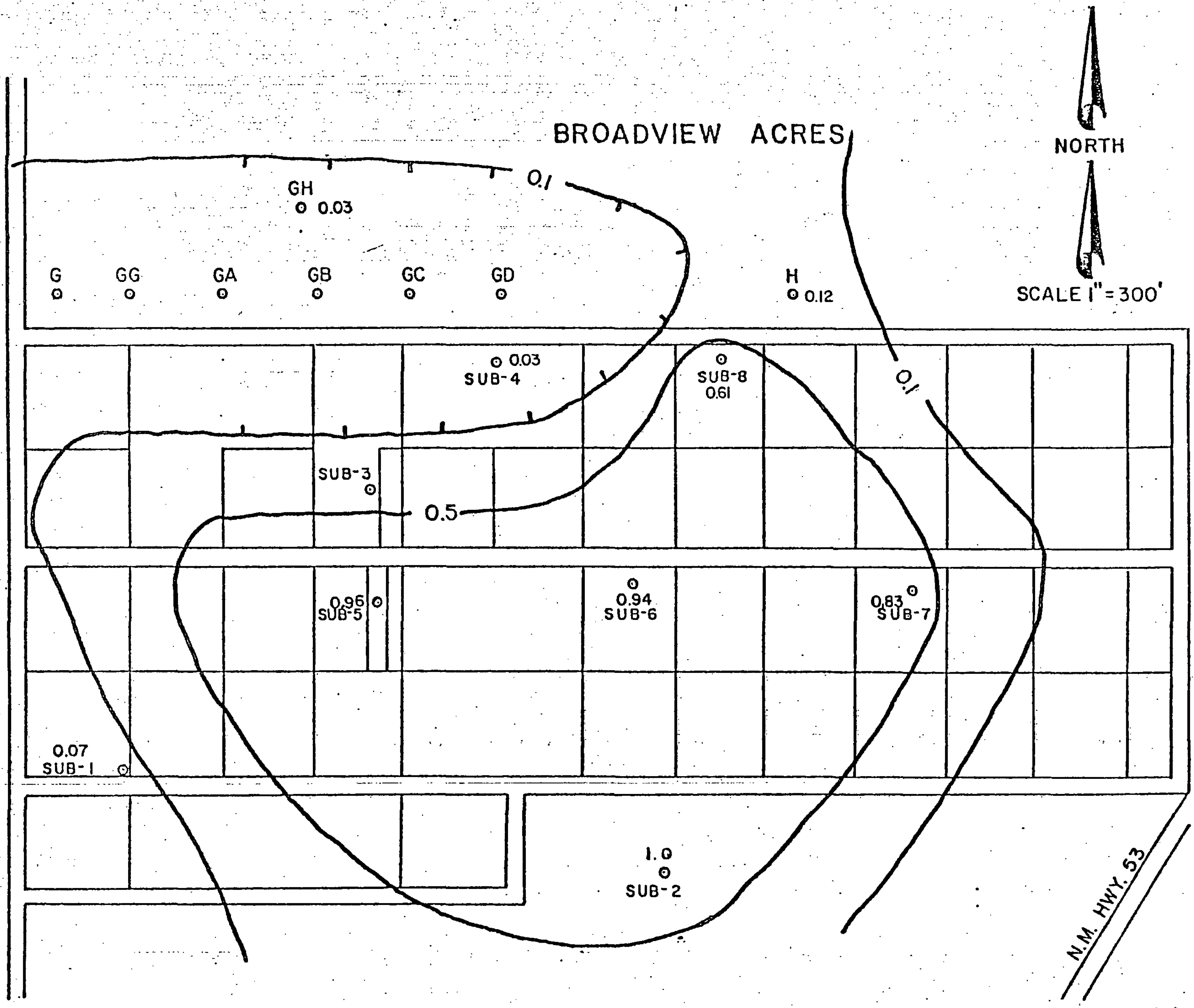


FIGURE 110. SELENIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN mg/l

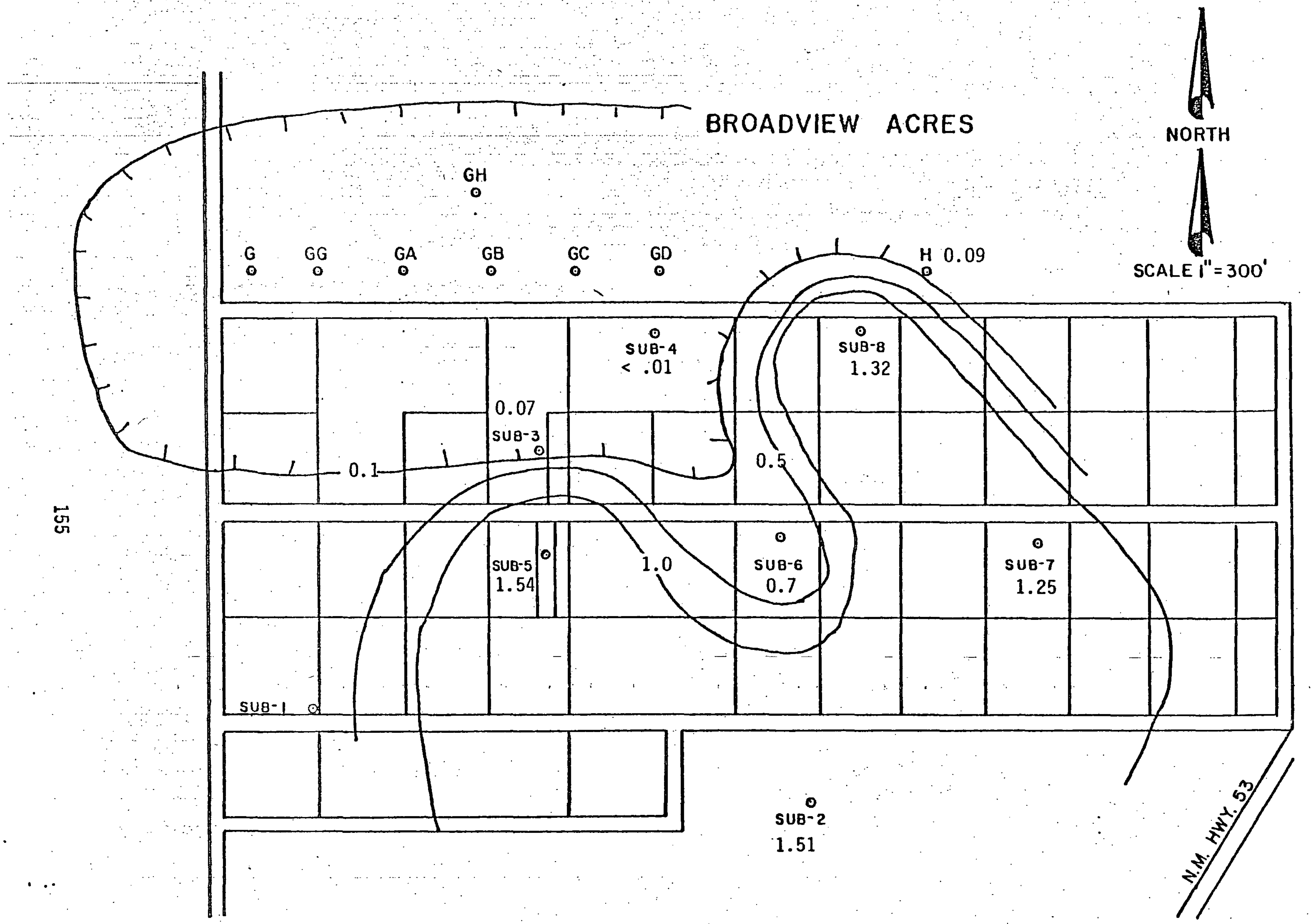


FIGURE 111. SELENIUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

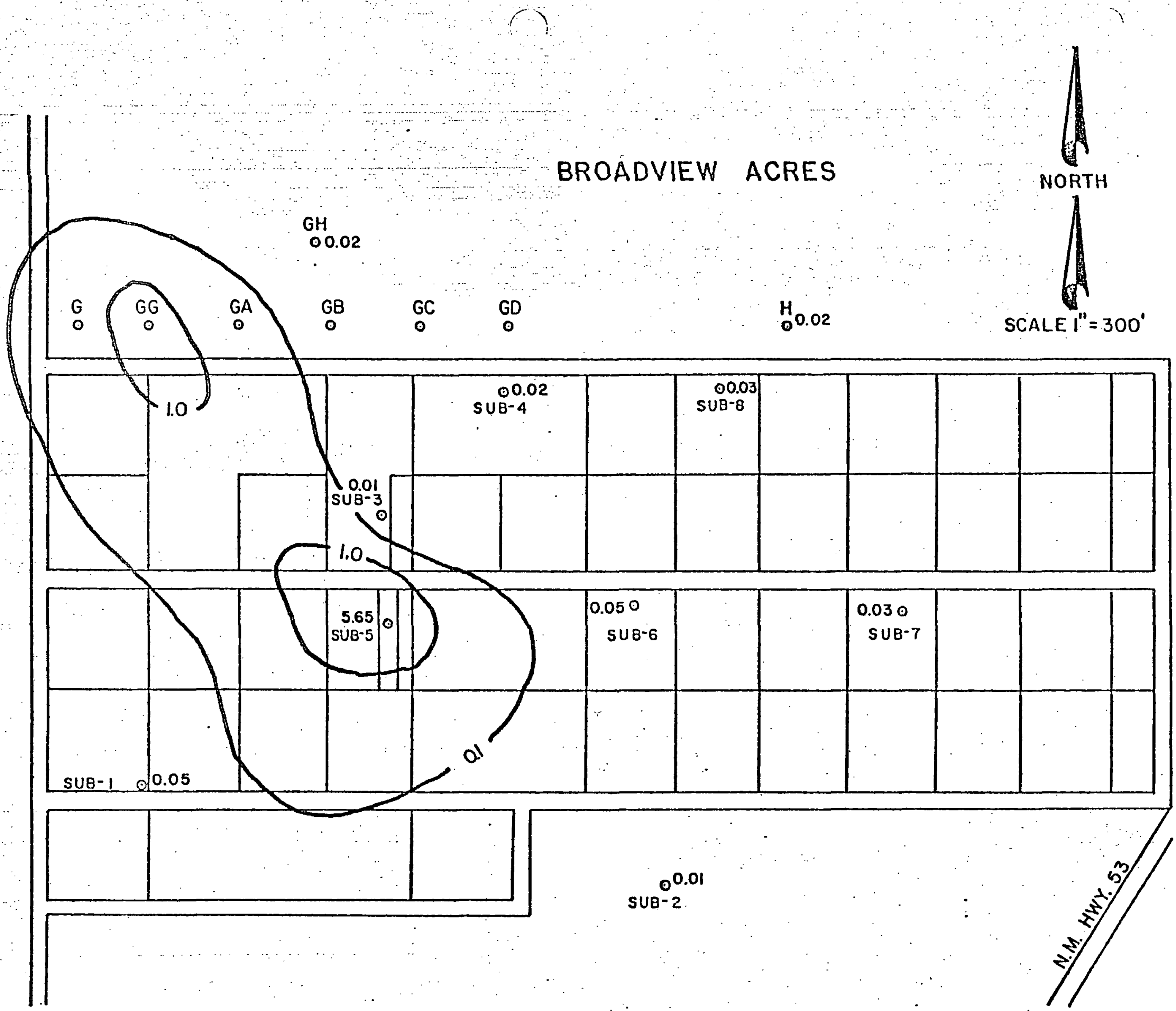


FIGURE 112. MOLYBDENUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN mg/l

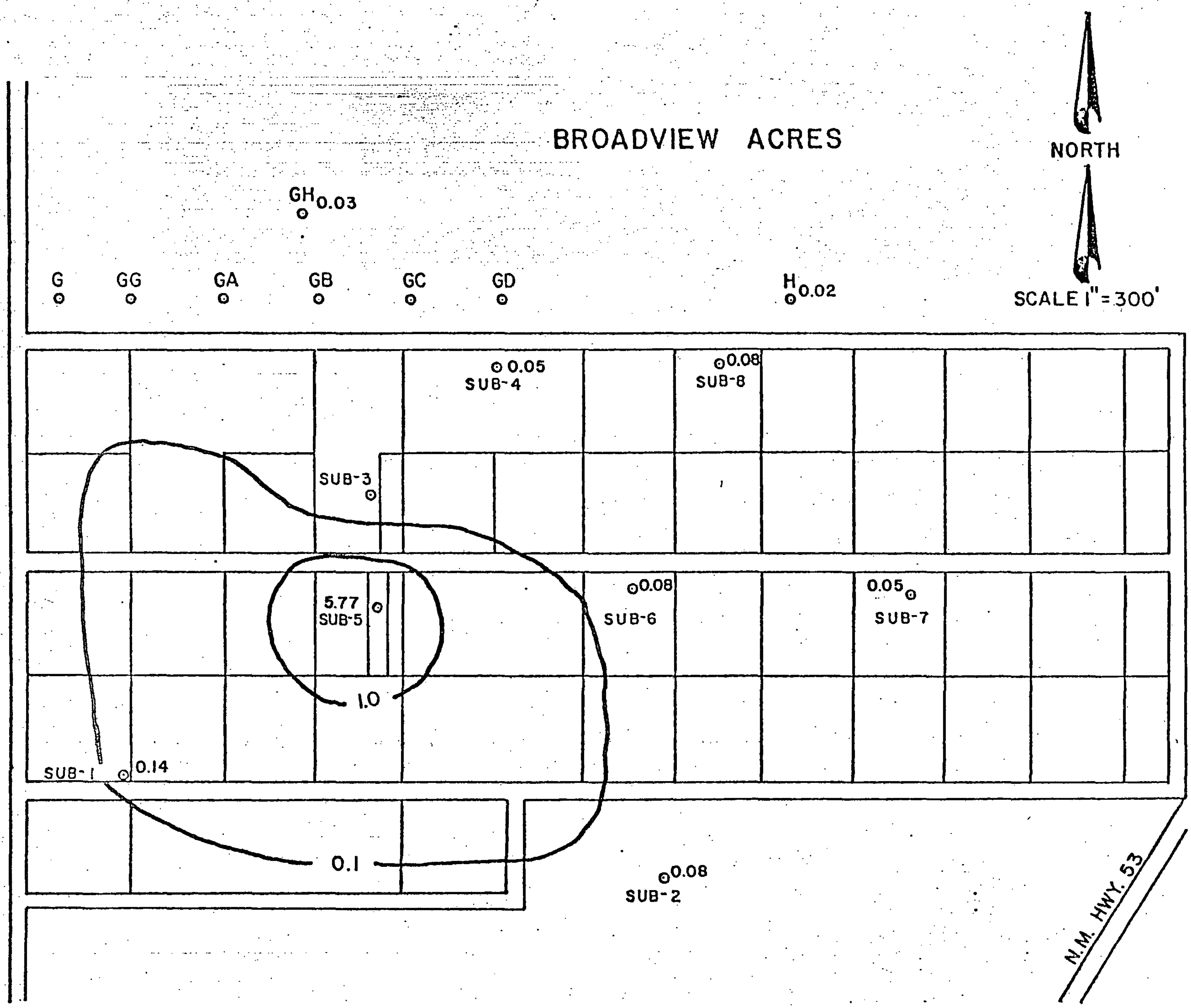


FIGURE 113. MOLYBDENUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN mg/l

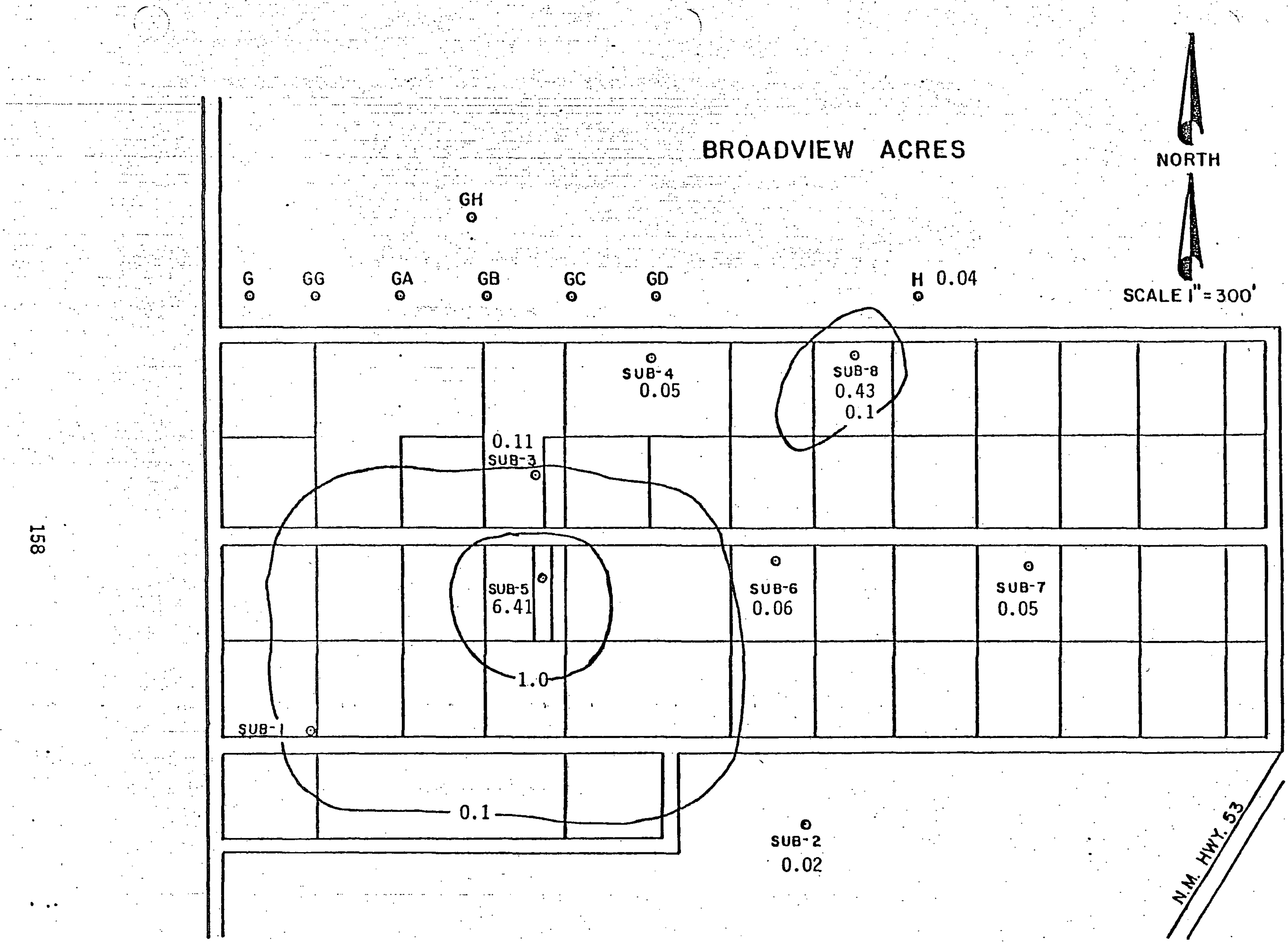


FIGURE 114. MOLYBDENUM CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, mg/l

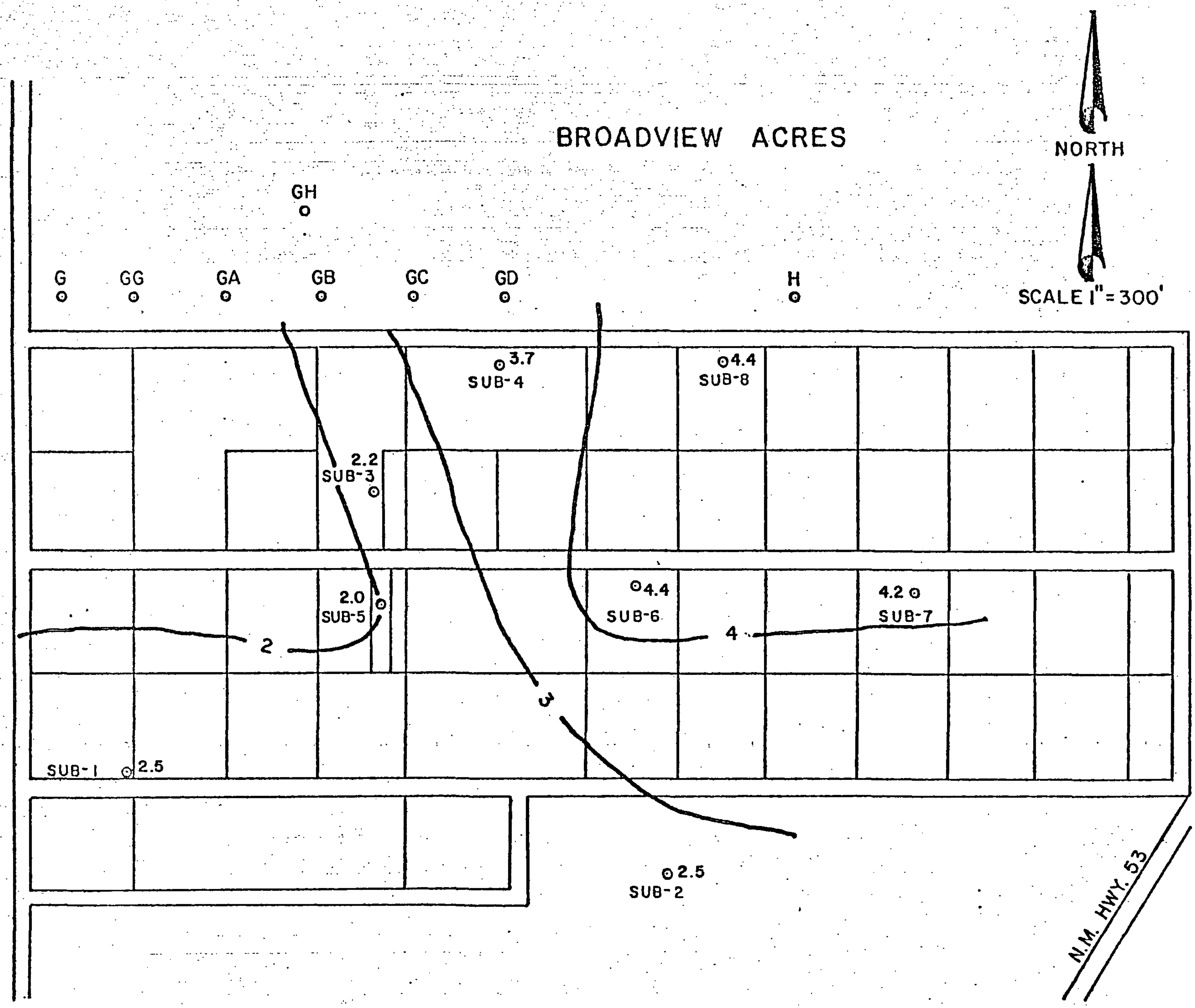


FIGURE 115. RADIUM 226 CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 6/13/77, IN pCi/l

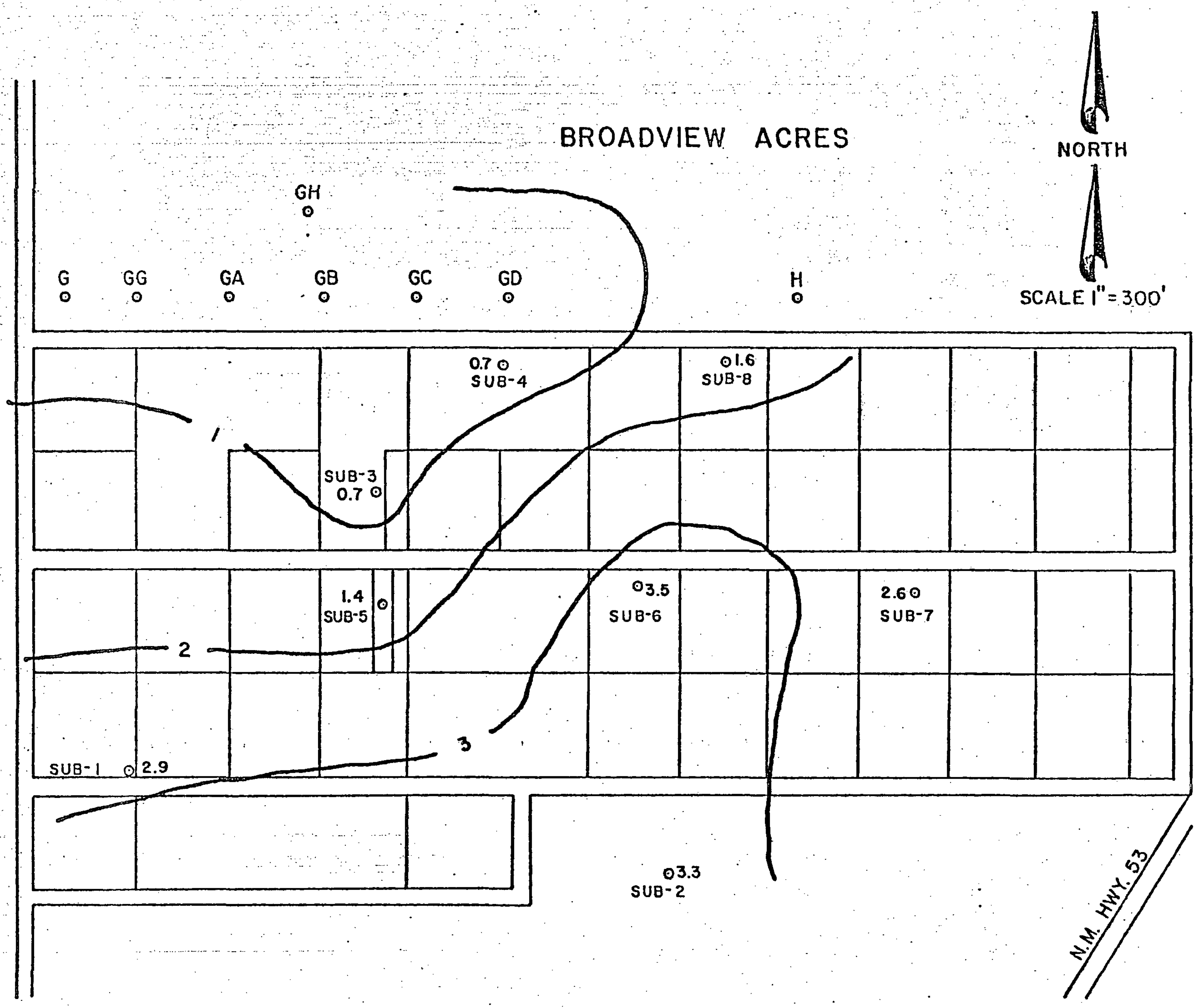


FIGURE 116. RADIUM 226 CONCENTRATION FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 11/30/77, IN pCi/l

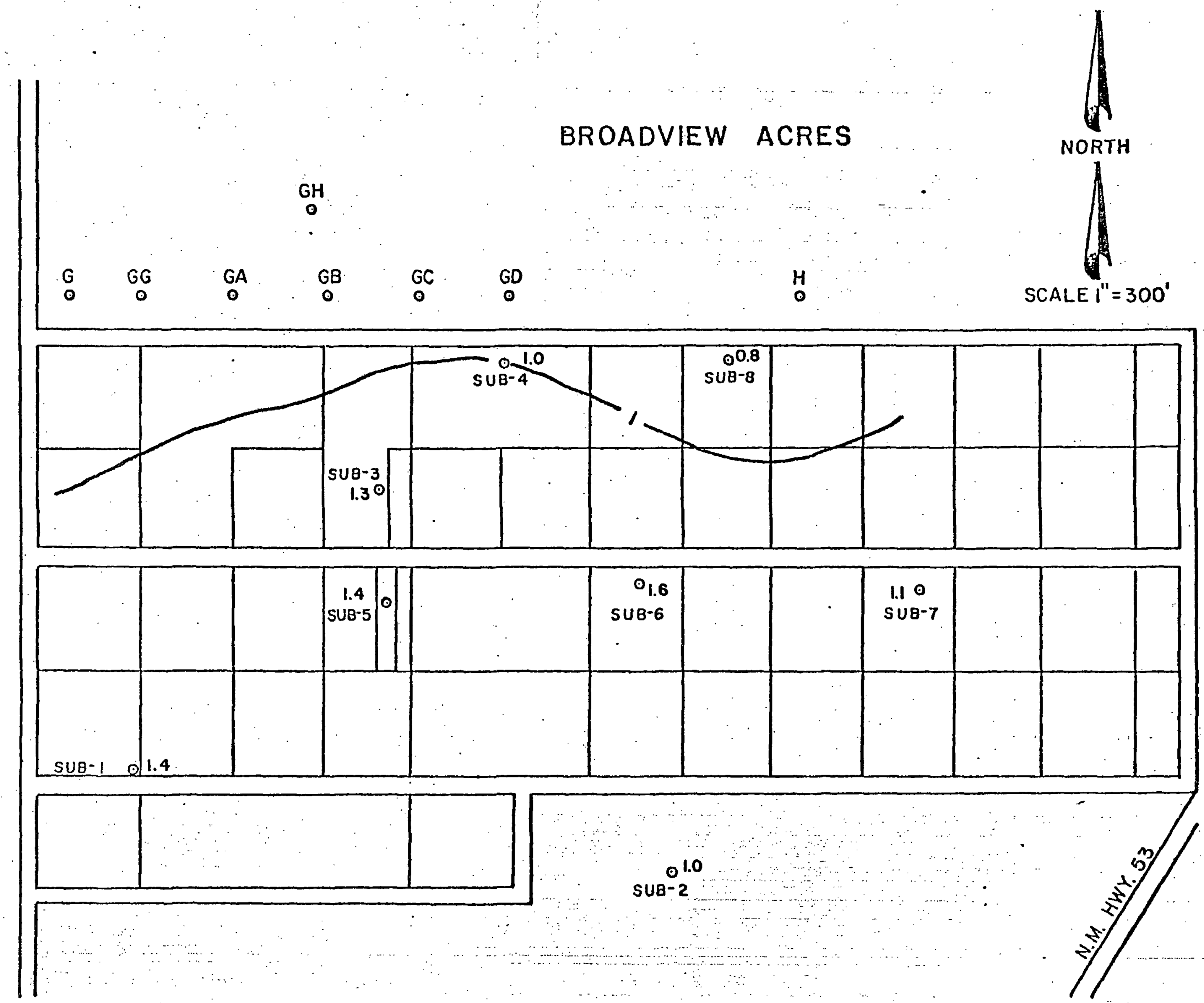


FIGURE 117. RADIUM 226 CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 7/13/78, IN pCi/l

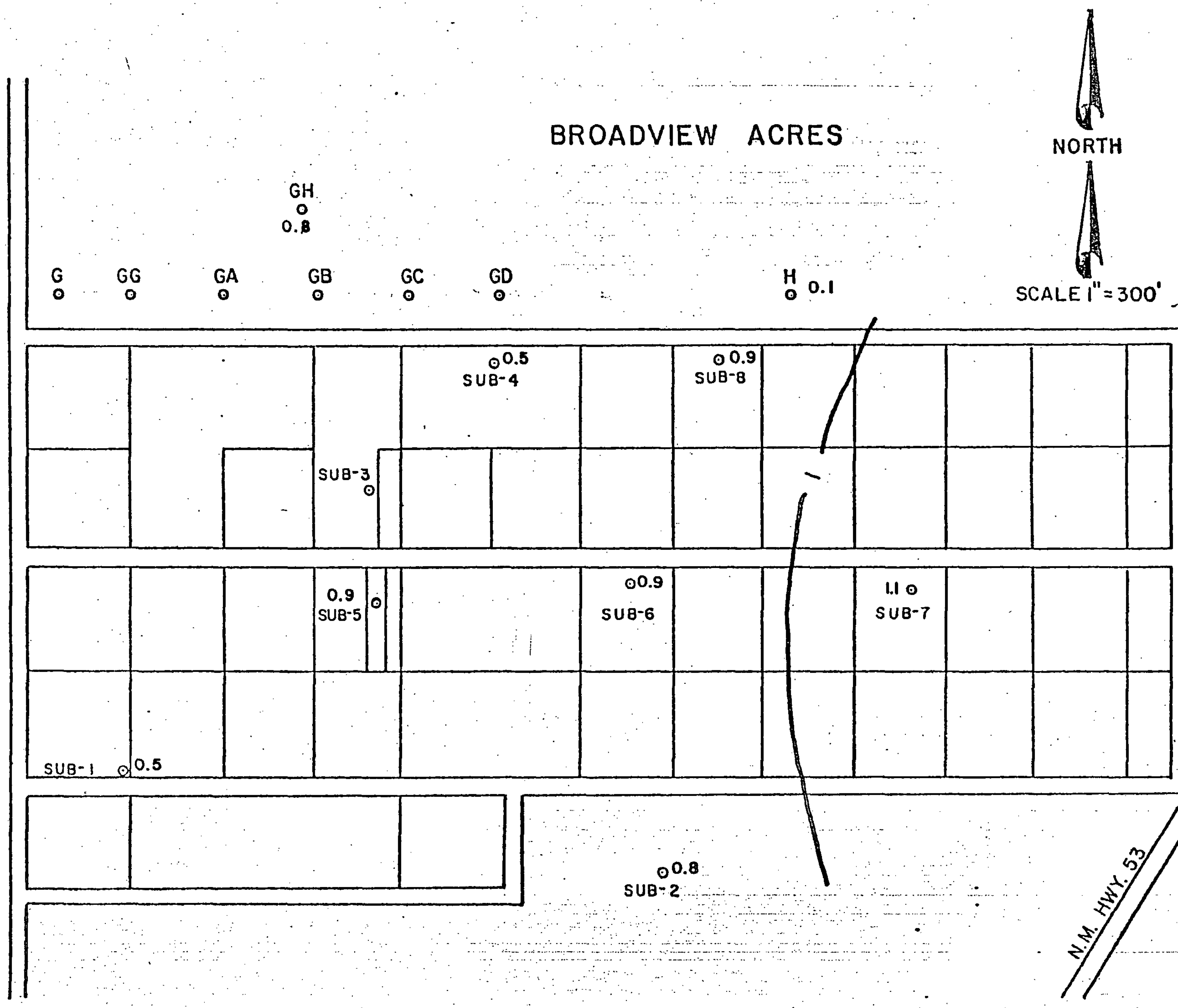


FIGURE 118. RADIUM 226 CONCENTRATION FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 2/13/79, IN pCi/l

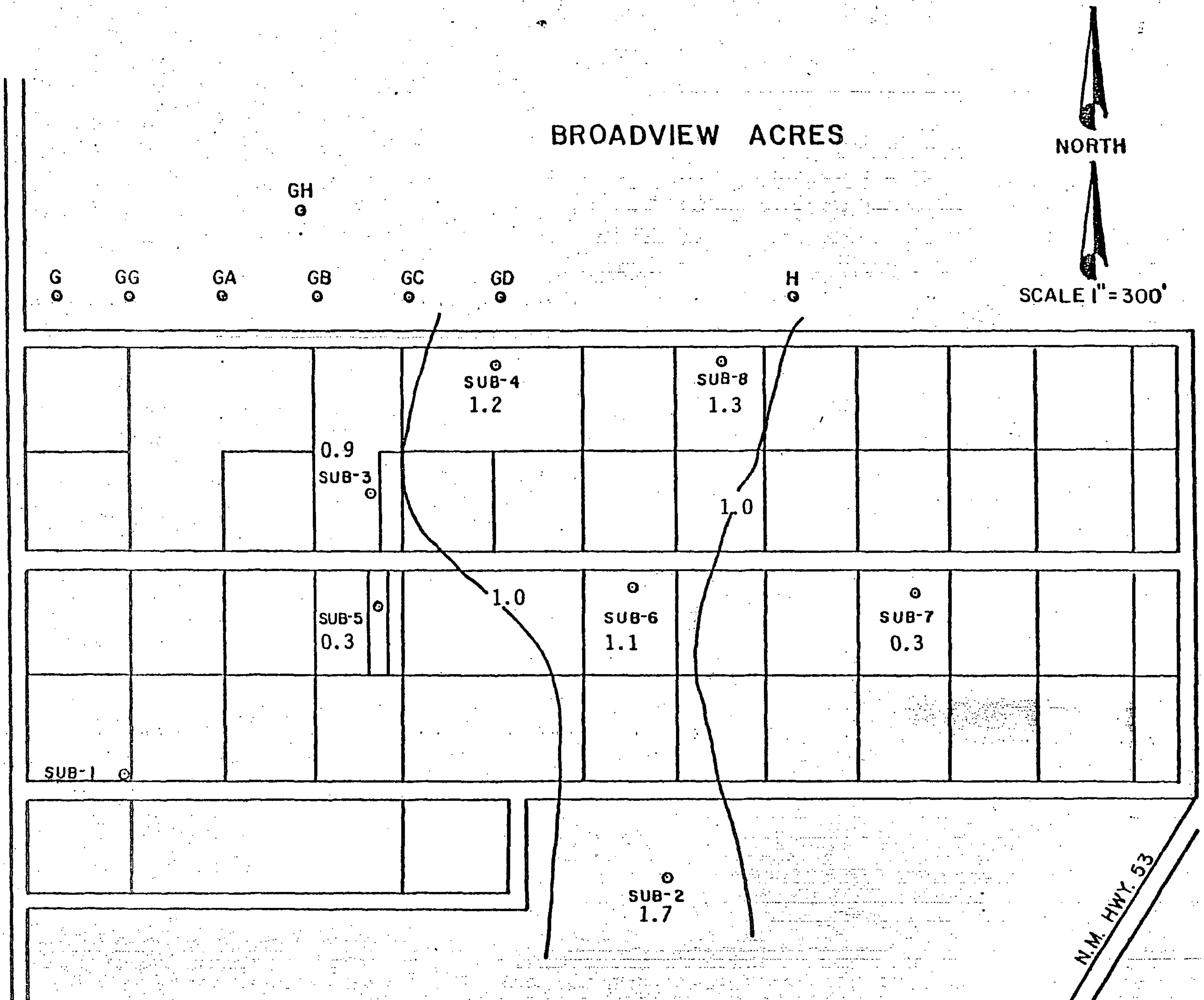


FIGURE 119. RADIUM 226 CONCENTRATIONS FOR BROADVIEW ACRES ALLUVIAL AQUIFER ON 8/80, pCi/l